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STEEL
PRODUCTION • PROCESSING • DISTRIBUTION • USE

As the Editor Views the News

AS THE framework of a building progresses upward from its base, so the structure of business recovery is erected tier upon tier from the bottom.

At some future date, the perspective of time will make it clear to us that the foundation for recovery from the great depression was laid in the sacrifices of 1929 to 1932, that the substructure was pieced together in the feverish expansive activities of 1933 and 1934, and that the first effective work on the superstructure began in the closing months of 1935.

BUT history will reveal something more vital than a mere recital of the structural details of the recovery edifice. Just as the Bible refers to the confusion of tongues in the construction of the tower of Babel, so will historians in the future discuss the conflict that raged among the architects of recovery in the thirties of the twentieth century.

They will present the facts in more orderly fashion than we can marshall them today. Theirs will be an almost incredible tale. It will begin with a description of a nation in great distress, a people crazed with fear. A new leader had been chosen. He had promised to build recovery on the tried and true lines of economy and thrift. In the emergency of the moment, the people granted their new leader unprecedented authority. Clothed with these unusual powers, he started to build. His advisers disagreed on the plans. One group insisted that the structure adhere to orthodox architecture. Another urged that every idea born prior to 1933 be avoided. Others advocated untried, revolutionary designs. The leader heeded the advice of the advocates of experiment.

The result was chaos. Part of the substructure erected in 1933 had to be torn down. A fresh start was made in 1934, but again much of the work had to be done over.

By this time the indentities of the disputing factions were clearly defined. On one hand were the true builders, who believed that the recovery structure should be simple architecturally. They insisted that the creation of wealth by private initiative and enterprise is the principle—and the only one—on which a permanent recovery can be built. On the other hand were diverse groups who, while avowedly belonging to the "planned economy" school of architecture, were prone to add fanciful, ginger-bread atrocities onto every load-bearing member of the recovery framework. They were opportunists.

By 1935 the leader had given the latter group so much leeway that their reckless and ill-considered architectural experiments threatened the safety of the supporting recovery skeleton. The matter went to the nation's council of nine elders, who on May 27 ruled that indiscriminate architectural furbelows have no lawful place upon the edifice of recovery. Their pronouncement caused great consternation in the ranks of the leader's advisers, but it gave an impetus to confidence in the minds of the true builders.

All are architects of Fate,
Working in these walls of Time.
—Longfellow

FORTHWITH the creators of wealth were heartened. They realized that the structure they were striving to erect henceforth would not be burdened so heavily by the deadweight of wealth-consuming folly. The fires of their furnaces were rekindled and the machines in their shops became active. They required more workmen to do the work that came to their hands. They turned out more goods, and their reward in the excess of income over outgo was sufficient, in many cases, to pay some return to those whose money was invested in their shops and equipment. Throughout the land, people who live from the profits on their money and those who live from the wage of their toil were benefited. As the year of 1935 closed, the people generally were better off

than at any time since the early months of 1930.

This, in brief, is the outline of what history will record for the recovery years of 1933, 1934 and 1935. Who can doubt but that 1935, with its significant court decision and its impressive demonstration of the resumption of wealth-creating activity on a worth-while scale, will find its place in the archives of time as a pivotal point in human progress.

THE past year was marked by intensive efforts on the part of industry to prepare for an anticipated increase in the volume of business. The unusual number of personnel changes recorded in the pages of STEEL during the year was an indication of the desire of management to rebuild its administrative, sales, research and operating forces to meet the challenge of constructive competition.

In many cases, revamping of personnel was a concomitant to changes in the corporate structure of companies. Notable was the move of the United States Steel Corp. to simplify or unify the operations of its principal subsidiaries. Of almost equal importance was the tendency among producers to merge with fabricators, consumers or distributors to extend further the scope of integration.

Of commanding importance in 1935 was the development of improved equipment and materials. The pages of this issue bear witness to the fact that 1935 was a year of outstanding technological progress. The machine tool show held in Cleveland in September, which probably ranks as the greatest display of new machines of all-time, was symbolic of the revolutionary changes that have taken place in many types of productive equipment during the past few years.

The advance in machinery and equipment was matched by unusual progress in the field of materials. The year witnessed important developments in the wider application of alloy steels, in the tendency to use steel of higher strength to save weight, and in the trend toward higher and more uniform quality in rolled steel, forgings and castings.

American iron, steel and metalworking industries face the new year more adequately prepared in personnel, organization, and morale, and with better equipment, a broader choice of materials and a more intelligent grasp of effective methods than at anytime in the past.

This is as it should be. Producers, fabricators, manufacturers—every unit in the broad field of metalworking—will be forced to the utmost to meet the challenge of reconstruction and expansion in 1936 and subsequent years. To rehabilitate the transportation system, to overcome the housing shortage, to complete the modernization of industry's plant and equipment, and to otherwise satisfy the post-depression requirements of this populous and still-wealthy nation will demand all of the ingenuity, resourcefulness and ability that industry can muster.

How much of this work will or can be accomplished in 1936 cannot be predicted with certainty. The consensus of opinion among economists and industrialists seems to be that the volume of business will exceed that of 1935 by a comfortable margin.

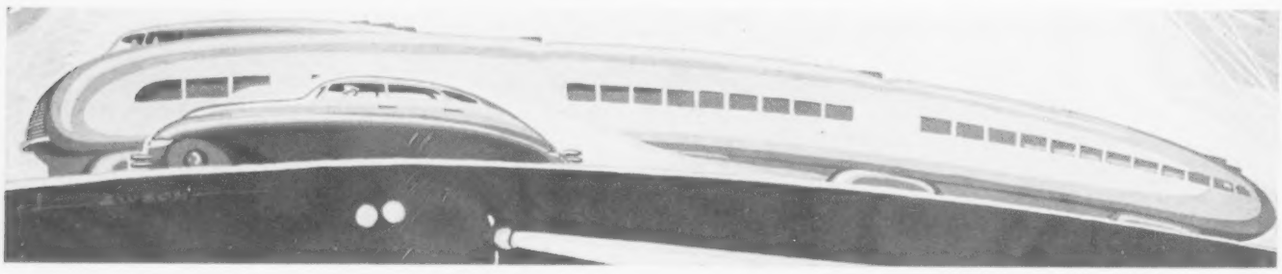
BUT of one thing we can be certain. The path to substantial recovery lies in creating wealth, rather than in dissipating it. Nothing that industry can do will contribute more to national prosperity than its determination and ability to produce more and better goods at the lowest cost consistent with reasonable profit.

> Whoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together.
>
> —JONATHAN SWIFT

The foregoing is as true today as it was when first written more than two hundred years ago. We need more production to create a greater ability to consume. Particularly we need more production in the field of capital construction. A demand for capital goods exists. The money is here—idle in the vaults.

May we not expect that in 1936, the combined pressure of need, ample money and returning faith in the age-old philosophy of industry and thrift, will help us to proceed more speedily with the erection of our recovery edifice!

E. L. Shaner



Heavier Steel Demand in 1936, Leading Outlets Indicate

A YEAR at least 10 per cent better than 1935! This is the studied conclusion regarding the probable volume of iron and steel business in 1936 that is warranted by a survey of the principal consuming outlets. A roundup of sentiment, which is presented in the pages that follow, portends that:

Building of all kinds will snap back 25 to 50 per cent.

Automobile assemblies will increase 10 to 15 per cent.

Consumption of tin plate for containers will rise 15 per cent.

Thirty-three per cent more steel will be utilized in air-conditioning structures.

Export shipments will expand several hundred thousand tons.

Home appliances made of steel will broaden their markets considerably.

(*Please turn the page*)

For mechanical refrigerators alone the expected increase in 1936 requirement for steel is 25 to 30 per cent.

Railroad equipment purchases will be heavier by 10 to 20 per cent. Demand for rails, track fastenings, and supplies of steel will be moderately higher.

At least 100,000 tons more steel than last year will be laid underground in oil, water, and gas pipe lines.

Demand for steel for the manufacture of machinery will be up 30 per cent, possibly reaching 1,000,000 tons. Large retooling programs for the navy and war departments, the railroads, and automobile manufacturers are in prospect.

Farmers will augment their purchases of implements, wire, roofing and other steel-made products fully 20 per cent, supporting the expectation that agricultural consumption of steel will reach 5,000,000 tons.

Handicaps Only Additional Incentive

So runs opinion concerning the 1936 iron and steel market, as the year opens. Only the passage of time, of course, will determine the country's requirements with exactness. There are variables in the political situation at home and abroad that may prove vital, uncertainties exist regarding government fiscal policy, legislation appropriating enormous sums threatens, a long session of congress has just convened, radical sentiment for social and pseudo-social programs is rife.

Notwithstanding all these uncertainties and handicaps, sentiment among the noteworthy users of iron and steel is that 1936 will carry on and better the improvement of 1935. For the country is recovery-minded. Recovery in industry is as inevitable as the depression was unstoppable. Each year since the low point of the depression—the autumn of 1932—has witnessed the accrual of more courage, more confidence, more determination to "damn the torpedoes," regardless of who planted them in the main channels of business, and go ahead. The will to recover is today's keynote of American thinking, and it will increasingly be externalized in business activity.

The recovery that was iron and steel's in 1935—it was almost 30 per cent by the yardstick of steel ingot production—was achieved in large measure in what are generally classified as consumer's goods, such as automobiles, mechanical refrigerators and other home appliances. To an undetermined, but probably large, extent this trend doubtless was stimulated by federal relief disbursements. The flush of prosperity in consumer's lines may have been somewhat artificial, but at the same time it appears to have initiated an upward cycle.

Comparatively little was accomplished in the way of whittling down the great deficiency in so-called capital goods, principally the machine tools and equipment utilized in the processes of manufacturing consumer's goods. For some special equipment, manufacturers are booked months ahead, but generally it is the yawning, idle capacity to make equipment that must be revived to spread prosperity thicker and farther. This, many believe, will happen in 1936.

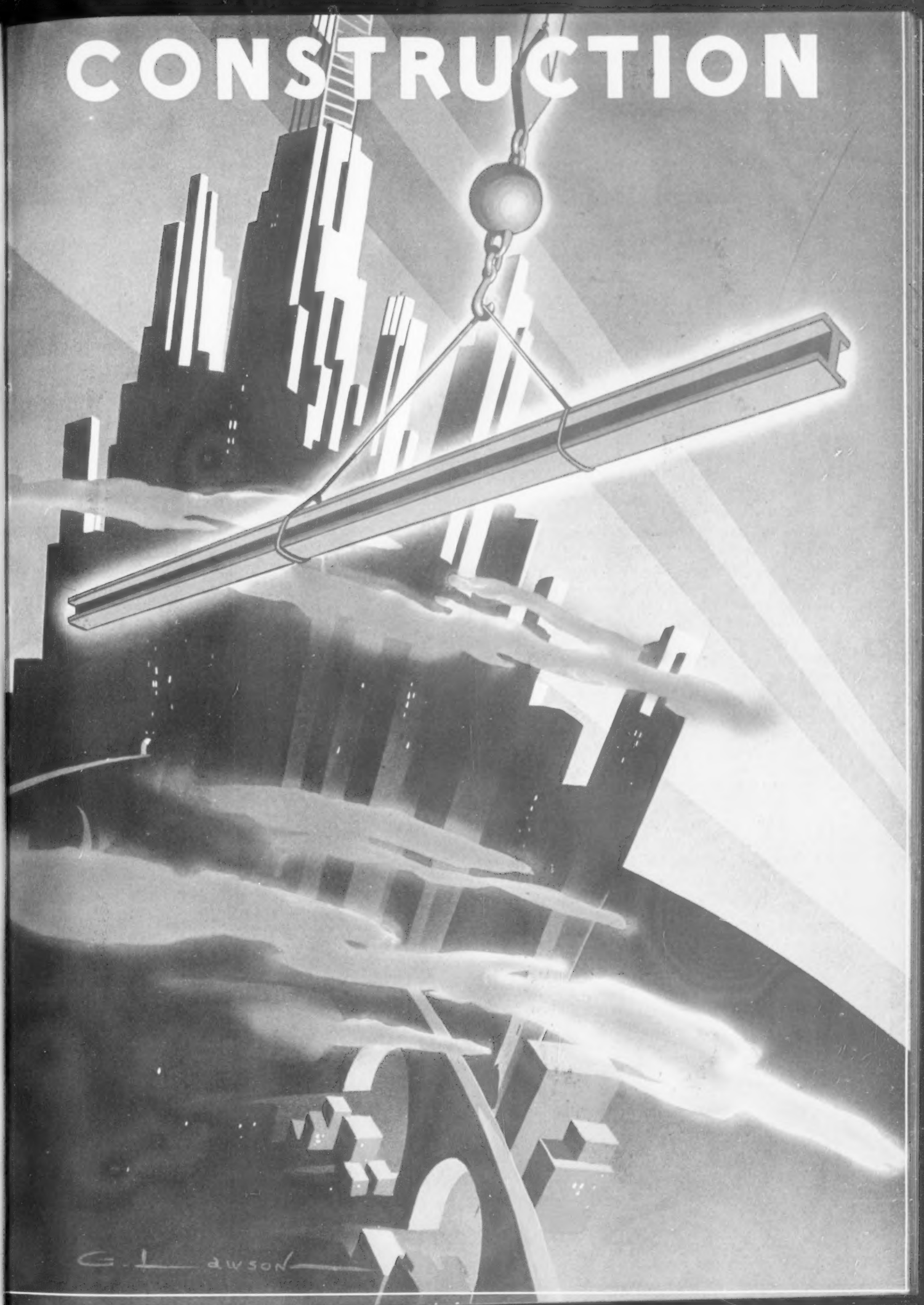
Steel the Base of Modern Life

Out of the metal steel the pre-depression pattern of comfortable living was wrought, and steel remains the base, yet also precious, metal out of which the enriched living of days to come will be fabricated. The thinking has been almost entirely in terms of steel in the modern styling of automobiles, the mechanization of the kitchen, the streamlining of railroad passenger equipment, the design of more economical freight cars, the air-conditioning of public and private buildings. In the following pages are analyses of the more important consuming outlets for steel, and the prospect that opens up before each as the new year—and a better year—gets under way.

Smoke Over Pittsburgh

Photo courtesy Pittsburgh Press

The denser the smoke pall over Pittsburgh the more prosperous this steel city is. And it's getting smokier now!


CONSTRUCTION
G. L. LAWSON

Building Is Forecast For 25 to 50 Per Cent Gain

Expansion in Steel House and Industrial Construction Expected To Feature 1936

IN NORMAL times considerably more than $6,000,000,000 is spent in a year for building construction in the United States, this being the value of contracts.

In 1935—after five years of restricted building operations—the amount was not much more than $1,600,000,000, or a little less than one-fourth of the sum in pre-depression years.

The very size of the industry under normal conditions, and the fact that it has been among those hardest hit by the depression leads to the belief that it must eventually show an enormous expansion. Forecasts from leading engineers and contractors indicate an increase of 25 to 50 per cent in building, this year.

Based on former averages, the country is about three years in arrears in its building operations—that is, the effect has been practically the same as though building had ceased altogether for that length of time.

Building expenditures in 1935 made only a slight gain over 1934. In the five years 1925-29 the value of contracts in 37 states averaged $6,213,894,000 annually. In the following five years, 1930-34, the average was $2,391,698,000, while in 1935, the value was about $1,670,000,000.

These values, of course, are not equivalent to floor area, as much more was obtained for the building dollar in recent years than prior to 1930, but they are more significant as indicators of two important factors in building operations—the measure of capital's confidence, and public purchasing power.

In the five depression years the values averaged 38 per cent of those in 1925-29. In 1935 they were only 70 per cent of the average in the depression years, and only 27 per cent of those in 1925-29.

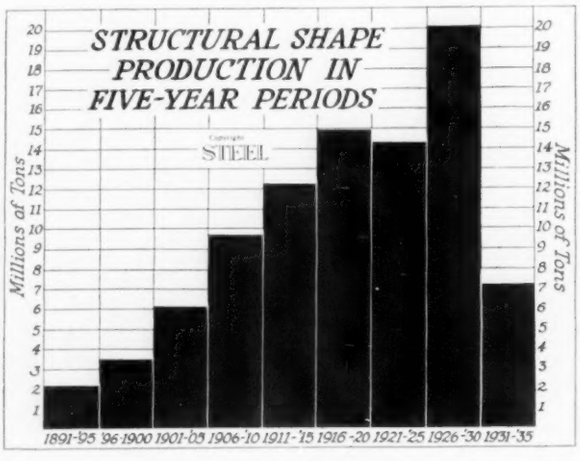
The result of this, in terms of steel, was to reduce the annual average of finished steel distributed for building purposes, exclusive of railroad structures, from 4,005,576 gross tons in 1925-29 to 1,802,642 tons in 1930-34. These are the figures reported to STEEL by 87 or more of the leading steel operating companies. They include erection materials, framework and trim. In 1935 the estimated tonnage was about 35 per cent of the annual average in 1925-29.

By far the largest tonnages of steel have gone into commercial, industrial, public and utilities construction. In 1925-29, however, the value of residential construction was nearly equal to that of commercial, industrial, public and utilities combined. In 1930-34 the residential value was less than one-half of the total for the others.

Construction values show these general proportions, the total being 100:

	1925-29 Per cent	1930-34 Per cent	1936 Per cent
Residential	41	22	28
Commercial	15	11	10
Industrial	7	6	9
Public and utilities	22	40	37
Miscellaneous	15	21	16

In dollars and cents, the residential and com-


STRUCTURAL SHAPE PRODUCTION IN FIVE-YEAR PERIODS
STEEL
Millions of Tons
Millions of Tons
1891-'95 '96-1900 1901-'05 1906-'10 1911-'15 1916-'20 1921-'25 1926-'30 1931-'35

Ups and downs of structural shape production, in five-year periods since 1891. The past five show an output little larger than in the five at the beginning of the century. This must soon be made up, builders say

Value of Construction Contracts

37 states; in dollars; 000 omitted

(F. M. Dodge Corp. Reports)

	Total	Residential	Commercial	Industrial	Public and utilities
1925	6,006,426	2,747,729	872,443	326,613	1,065,947
1926	6,380,914	2,671,120	920,890	471,249	1,340,351
1927	6,303,055	2,573,316	932,911	375,910	1,381,973
1928	6,628,286	2,788,317	884,609	508,840	1,464,480
1929	5,750,790	1,915,727	929,188	545,861	1,458,992
5-year av.	6,213,894	2,539,242	908,008	445,695	1,342,349
1930	4,323,114	1,101,312	616,319	256,632	1,651,238
1931	3,092,849	811,388	311,105	116,157	1,171,115
1932	1,351,158	280,067	122,718	43,490	590,301
1933	1,255,708	249,262	99,371	127,517	602,722
1934	1,543,101	248,840	150,595	116,078	751,236
5-year av.	2,391,698	538,174	260,023	131,975	953,322
(10 mos.) 1935	1,392,561	394,007	139,678	90,135	515,383

mercial classes have shown the sharpest decline from former years. Thus, in 1930-34 actual values for residential averaged only 21 per cent of 1925-29; commercial only 21 per cent; industrial 29; and public and utilities 71 per cent. In 1935, residential and also commercial structure expenditures were only 18 per cent of 1925-1929 averages; industrial 24 per cent; public and utilities, 46 per cent. Figures in detail are given in an accompanying table.

The outlay for residential construction dropped from a 5-year pre-depression average of $2,539,000,000 to a 5-year depression average of $538,174,000, and to about $470,000,000 in 1935.

Residential construction reached its low point in 1934, with a total value of $248,840,000. Hence the gain in 1935 over 1934 was about 89 per cent. Commercial building was up only about 11 per cent from 1934; while the values of new construction contracts were not quite up to 1934 for either industrial or public and utilities.

While these significant changes were occurring, steelmakers were driving hard to take advantage of the market afforded by new residential construction, and public interest in steel.

An outstanding example of steel-frame house construction. Forty-five tons of steel is being used in this structure now being built at Ottawa Hills, near Toledo, O. Practically all this steel is going into wall frames and floors

The 1930 census showed 25,204,976 dwellings occupied by 29,904,663 families. Of these dwellings 22,833,110 were of the one-family type; 1,778,087 two-family and 643,779, three or more families. Locations were: 13,046,699 urban; 12,158,277 rural.

It is estimated 600,000 new dwelling units are needed annually at a cost of $2,500,000,000, to replace old houses, and provide for growth in population. Here are the numbers actually built, and the number estimated for 1936:

1930	256,000	1934	72,500
1931	211,000	1935	100,000 est.
1932	82,000		
1933	81,500	1936	200,000 est.

On a basis of 600,000 dwellings needed annually, and figuring 3 to 5 tons of steel for frames per dwelling, the potential market would be 1,800,000 to 3,000,000 tons, chiefly strip steel. Steelmakers believe 500,000 dwellings to be a conservative estimate, and expect this number will be erected in 1936, with possibly 1,000,000 in each of the following two years. Considering only the amount of steel which would be required for frames, this would mean for 2,500,000 dwellings 7,500,000 to 12,500,000 tons of steel

Financing, an Important Link

Recently the government made a survey of 1,931,055 structures, which included 2,633,135 dwelling units in 64 cities, and of these, 1,538,708, or 79.9 per cent, were occupied by single families.

The number of units built of wood was 1,584,032, or 72.6 per cent of the total, and brick, 306,532, or 15.5 per cent. In both these classifications steel could have been used. About 297,791, or 15 per cent of the total, were in need of structural repairs.

Several hundred steel-frame houses were built in 1935. Realizing that the complete steel house will be developd and win general acceptance only through a gradual process of planning, steelmakers have concentrated their efforts in the steel-frame structure.

Five tons of steel in frames and joists for a 6-room house, plus other items, such as steel stairways, are believed to be probable for the near future. In 1934 the average price paid for single dwellings of all types of construction was $6050. A steel frame house can be built for $5000 to $10,000, with an average probably as low as $6000.

One reason for the gain in house construction in 1935 was the financial aid extended by the government. A number of large home construction companies, and even mail order houses, introduced prefabricated steel houses, offering to finance purchases. Steelmakers consider that some simple method of mass financ-

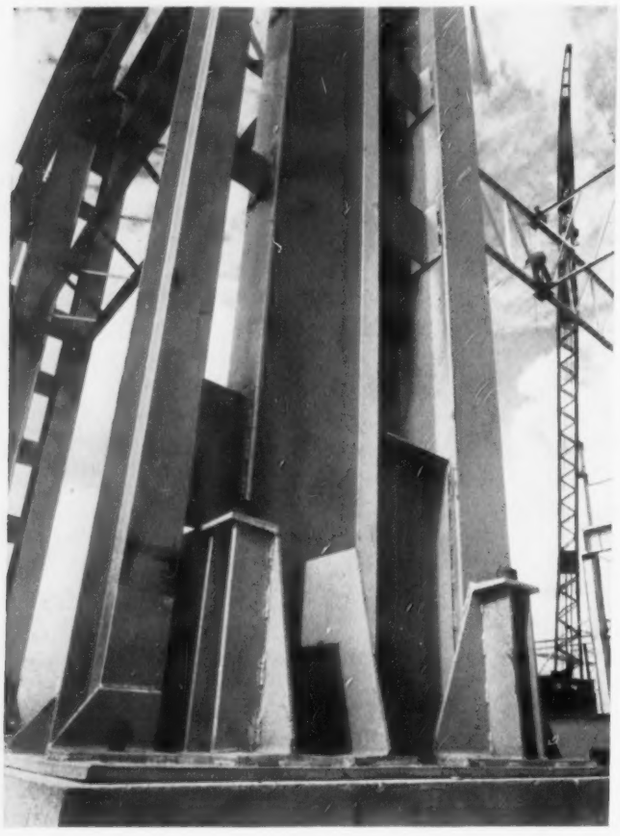
ing will be necessary with mass prefabrication.

In industrial and commercial construction, STEEL's records of structural shape awards, of 100 tons or more individually, show a substantial gain for 1935.

In 1934 such awards amounted to 128,506 tons, or 15 per cent of the total, in 1935 they aggregated 185,900 tons, or 21 per cent of 895,000, with late December estimated. By comparison, the awards of structural shapes for all purposes, as compiled by STEEL, totaled 801,493 in 1933, low point of the depression, and 2,195,000 tons in 1929.

The steel industry itself was a leader in construction work in 1935, with such items as 16,000 tons, placed by the Great Lakes Steel Corp. for a strip mill at Detroit; 12,000 tons for the Carnegie-Illinois Steel Corp.'s plate mill at West Homestead, Pa.; 10,000 tons for Bethlehem Steel Co.'s sheet mill at Lackawanna, N. Y. (Buffalo), and 846 tons for American Sheet & Tin Plate Co.'s mill buildings at Gary, Ind.

The principal improvement in industrial construction in 1935, according to leading contracting companies, was in the chemical industry. The same authorities express the belief that this industry also will be the leader in 1936. Either the automobile industry or public utilities is expected to be a close second.



Fifty of these massive columns of welded steel support the huge 200-ton electric traveling crane installed in the diesel-electric locomotive plant erected recently at McCook, Ill., for Electro-Motive Corp., General Motors subsidiary. Mass production methods will find their first complete application to the locomotive industry in this plant, which will carry the heaviest load of any structure ever welded. Photo, courtesy The Austin Co., Cleveland

Ninety per cent of the construction work now contemplated by the utilities is due to actual necessity. The power load at times in 1935 was in excess of that in 1929, and expansion is considered imperative.

Oil companies in recent months have been carrying on a relatively good program of plant expansion, and they are expected to be an important factor this year.

Some builders do not see any "real recovery" in industrial construction until industry has a clearer idea of what the future tax burden will be.

Comparatively few such projects are being undertaken with the idea that inflation is on the way, and incidentally there is practically no important large office building construction under way anywhere in the country, and apartment building at present is restricted to the cheaper types.

A 50 per cent increase in industrial construction in 1936 is foreseen by George A. Bryant Jr., executive vice president, The Austin Co., Cleveland.

This estimate is made in the light of an 81 per cent increase in the company's business for the first 10 months of 1935, compared with the same period in 1934. In October contracts received by company were 137 per cent above October 1934.

Steel Markets Barely Tapped

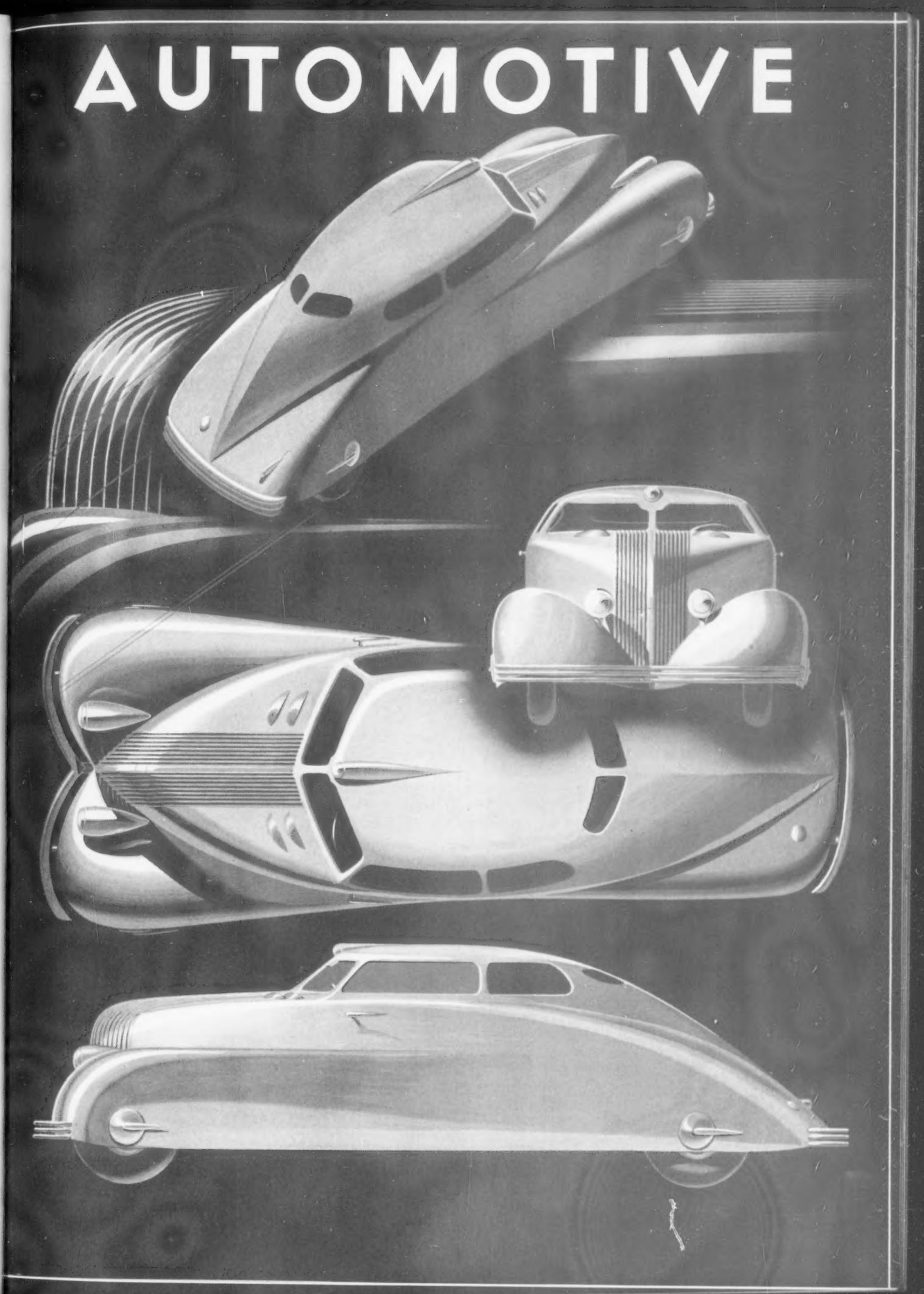
"Analysis of depression losses has convinced many executives that their plants might have broken even through the period since 1929 if they had been more advantageously located, and flexible enough to permit adjustment of operations to the fluctuating volume of business," Mr. Bryant said.

"Now markets have shifted; new materials are being used; and improved highway and trucking facilities have changed the whole distribution picture. Each of these developments has made certain plant relocations desirable.

"Manufacturers of steel and other metals have barely tapped the markets awaiting them in construction fields. Today, perfected steels offer structural stability, decorative character and economy which will ultimately exert a powerful influence in all building and upon building costs.

"With the perfection of new metal products to fulfill a broader range of structural functions, the proportion of all building expenditures finding its way into the steel industry is bound to increase. It is not too much to expect that it might double annually for several years to come."

AUTOMOTIVE



Automotive Minimum Placed at 4,250,000 Units

Look to Depression - Deferred Replacements For Big Backlog; More Equipment Needed

IN A day when cumulative production of passenger cars and trucks has passed 55,000,000, when registrations total 26,100,000 or 1 for every 4.86 persons, and the automobile is accepted as a concomitant of modern living, it is easy to assume that the automotive industry has always been a major one. The fact is, its growth has been slow and only in the past decade has it achieved major rank in the industrial economy of the United States.

Not until 1923 did the automotive industry consume so much as 10 per cent of the nation's output of steel in a single year; not until 1928 did it become the leading customer of the steel industry, and even then it surrendered that title for the three succeeding years. Its spirit, the average low age of its executives, its commanding tone toward suppliers, its resistance to the regimentation of the new deal, and its fearlessness in labor matters attest its youth.

War Brought First Million-Car Year

Born in the late 90's, the automobile made a hesitant right turn into the twentieth century. In the opening year 1900 only 4192 passenger cars were made—fewer than Ford alone now assembles in one day, and no trucks. By 1910 there was a slow but solid growth to an annual output of 187,000 units, of which 6000 were trucks, and mechanical progress was such as to indicate that a racing phenomenon and rich man's plaything was ordained to become individual transportation.

Passing quickly through its period of puberty the automotive industry—it was attaining the dignity of an industry by then—concluded the first year of the World war with a total of 569,054 units. It required the span from 1900 to 1914 to achieve the proportions of a half-million car year, but only two years more in which to cross the million mark, for by 1916 production had swept up to 1,617,708 units.

Fittingly enough, it was the great year 1920 that enabled the industry to achieve the two-million mark. There was no mistaking then that here was an industry that was going places. With residential building it lifted the nation out of the first backwash of the World war; in 1922 it initiated recovery from the second depression—just as at present it is in the vanguard of recovery from the third. Excepting a minor setback in 1924 and a slightly more pronounced one in 1927, the postwar period culminating in 1929 was a succession of production triumphs.

For steel, the decade 1920-29 was one of increasing attendance upon this expanding market. From an estimated 7.5 per cent in 1920, the automotive industry's participation in steel consumption soared to almost 18 per cent in 1929. In these ten years automobile manufacturers fabricated 41,491,473 gross tons of finished steel, not including engine blocks and other castings, into 35,709,464 cars and trucks. In the following table is given an analysis of the 1920-29 market:

Year	Car and Truck Production in United States	Automobile Consumption of Finished Steel % of Output	Gross Tons	Pounds Finished Steel per Car
1920	2,227,349	7.50*	2,426,089	2439
1921	1,616,119	9.82	1,450,807	2010
1922	2,544,176	8.98	2,375,390	2091
1923	4,034,012	10.59	3,524,042	1957
1924	3,602,540	11.37	3,193,427	1985
1925	4,265,830	14.60	4,874,496	2559
1926	4,300,934	15.09	5,356,330	2789
1927	3,401,326	13.34	4,386,062	2888
1928	4,358,759	17.76	6,688,934	3437
1929	5,358,420	17.57	7,215,896	3017
Average	3,570,946	13.15	4,149,147	2598

*Estimated.

FROM the all-time record of 1929, when 5,358,420 units were assembled, the automotive industry succumbed rapidly to depression influences, dropping like a plummet to a depression low of 1,370,678 units. In three years the industry surrendered all of the gain of the preceding eleven, falling back to the 1928 level.

But the rebound since 1932 has been almost

as striking. With December estimated, 1935 assemblies at 3,900,000 units were 73 per cent of 1929.

Even in 1929 automobiles had been crowded off the pinnacle of steel consumption, but in 1932, difficult a year as it was, the relatively harder straits of the building industry and the railroads returned the pennant to automobiles.

In the following table the rising average poundage of steel per car assembled appears anomalous in view of the ascendancy of the small car; one explanation is the abnormal demand for repair and replacement parts at a time when average car life was being lengthened by the depression's incidence on incomes:

Year	Car and Truck Production in United States	Automobile Consumption of Finished Steel % of Output	Gross Tons	Pounds Finished Steel per Car
1930	3,355,986	14.10	4,161,334	2777
1931	2,389,730	14.78	2,834,197	2576
1932	1,370,678	18.15	1,896,856	3091
1933	1,920,057	20.95	3,505,982	4088
1934	2,753,111	20.87	3,948,830	3203
1935*	3,900,000	(See consumption figures on page 206)		

*Estimated.

WHAT of 1936? After recognizing many variables in the general economic and political situation that might affect the retail market, opinion is unanimous that this year will carry on the improvement of last year. The difference in forecasts is one of degree.

At the outset, consideration must be given the fact that, through the introduction of new models in November, automobile manufacturers deliberately borrowed from the future and matured demand that normally would have developed following the January shows. This anticipated business is conservatively estimated at 400,000 units—practically all passenger cars. A balanced comparison of 1935 and 1936 is thus rendered impossible, and this poaching on the 1936 market accounts for the growing conservatism of predictions as 1935 ended.

One outstanding manufacturer believes the increase over 1935 will be slight because of this robbing of the future. At the pot-of-gold end of the rainbow is the English economist who visualizes the dammed-up replacement market breaking loose, creating a market for 9,000,000 units, of which only 6,000,000 can be supplied this year—hence a boom. Most forecasters who carry weight are on the conservative end of the issue, holding to a 10 to 15 per cent increase.

General Motors, for example, is basing its campaign on a 4,250,000-car year, including 104,000 units for Canada, which indicates a gain of 11 per cent. Its expectation is:

	United States Domestic Market	Canada	For Export
Passenger cars	3,000,000	85,000	335,000
Trucks	630,000	19,000	181,000

Col. Leonard P. Ayres, noted economist of Cleveland, estimates the increase in production in 1936 at not to exceed 12 per cent over 1935.

An excursion with analysts and economists into the realm of the 1936 market is both interesting and educational. These experts break this year's prospects down into three divisions: (1) Expansion; (2) Normal and deferred replacement; and (3) Export.

1. Expansion

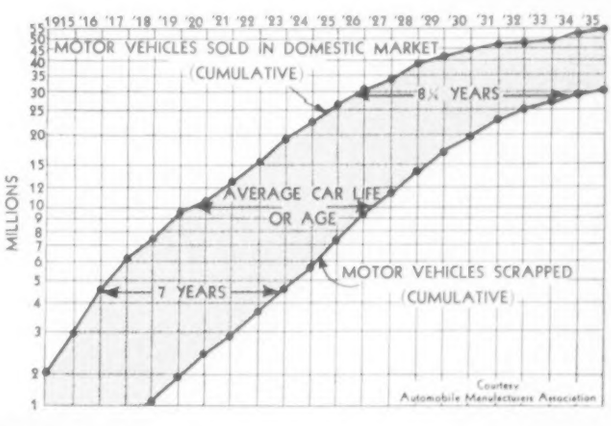
In more ways than one, population has been running a losing race with motor vehicle registrations. Notwithstanding the increase in population, registrations have been sweeping upward, until in lush 1929 the ratio of population to every vehicle in operation was the lowest on record—4.58. In 1930 this ratio began increasing, and this retrogression was not halted until 1934. In 1935 there was a further betterment of this position, and it is quite probable that by the end of 1936 a new high in density of motor vehicles will be set. A comparison of population, registration and the ratio of persons per vehicle follows:

Year	Population, United States	Registration, All Motor Vehicles	Ratio of Population Per Vehicle
1925	115,378,000	19,937,274	5.78
1926	117,136,000	22,001,393	5.32
1927	118,628,000	23,133,243	5.12
1928	120,013,000	24,493,124	4.90
1929	121,500,000	26,501,443	4.58
1930	122,775,000	26,545,281	4.62
1931	124,070,000	25,832,884	4.80
1932	124,822,000	24,115,129	5.17
1933	125,693,000	23,843,591	5.27
1934	126,425,000	24,933,403	5.07
1935	127,172,000	26,100,000	4.86

Such an elusive figure as "new owners" is obviously difficult to track down, but the Automobile Manufacturers' association defines it as net additions to registrations, that is, the number of new vehicles estimated to have been sold in excess of the old ones scrapped.

Assuming this calculation to be enlightening, 1923 was the peak year for new owners, when 2,921,686 persons joined the motor cavalcade. By 1929 only 1,851,371 new owners registered. This figure dropped to 66,043 in 1930, and in 1931 and 1932 more cars were taken from service than were entered.

But the tide turned in 1933, when there were


1915 '16 '17 '18 '19 '20 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 '34 '35
MOTOR VEHICLES SOLD IN DOMESTIC MARKET
(CUMULATIVE)
8½ YEARS
AVERAGE CAR LIFE OR AGE
7 YEARS
MOTOR VEHICLES SCRAPPED
(CUMULATIVE)
MILLIONS
Courtesy Automobile Manufacturers Association

59,817 new owners, it was swelled to 779,589 in 1934, and last year rebounded to 1,115,000. An estimate of new owners for 1936 is above 1,500,000.

There will be no way of segregating it, but the increase in the "new owner" category this year is more likely to result from additional registrations in a family than from persons never before owning a car.

2. Normal and Deferred Replacements

There is no royal road to ascertaining average car life or, as some prefer to call it, average car age. One way, however, is this:

Take a given year's production, minus exports plus imports, to develop the domestic market; add this net additional domestic output to the preceding year's registration; then subtract the current year's registrations—and the difference is the number of cars scrapped or withdrawn from service.

The plan is not perfect, but there seems to be no alternative. This figure for motor vehicles scrapped, on a cumulative basis, is plotted in the accompanying chart alongside the cumulative figure for sales or production—it being assumed that the latter figures are synonymous. One deduction is that prior to the depression the average life—or age—of cars was 7 years, but has since lengthened out to 8¼.

The following table puts the 7-year theory to the test; it provides a deadly parallel of scrapping or replacements after a lapse of 7 years:

Domestic production		Scrapped or replaced	
1918	1,125,642	1925	1,670,337
1919	1,845,965	1926	1,824,230
1920	2,051,164	1927	2,110,214
1921	1,555,984	1928	2,516,868
1922	2,417,587	1929	2,772,838

In three of these five years—1926, 1927 and 1929—the number of units scrapped comes comfortably close to the number assembled 7 years prior. In the five years 1918-22 domestic production was 8,996,342 units and replacements 1925-29 10,894,487.

Now look at the record for the depression period:

Domestic production		Scrapped or replaced	
1923	3,799,788	1930	2,884,228
1924	3,310,018	1931	2,915,024
1925	3,837,841	1932	2,492,140
1926	3,908,854	1933	1,683,956
1927	2,935,577	1934	1,863,000
1928	3,776,583	1935	2,400,000

The lag in replacements beyond the 7-year period is very evident. The accompanying chart indicates the gap at 8¼ years, instead of 7, and the mathematics of it is involved, yet it is obvious that an enormous replacement market has been dammed-up. In the six years 1923-28 inclusive domestic production has totaled 21,568,661, but apparent replacement 1930-35 has been only 14,238,348. Here is a spread of seven million deferred replacements over what the pre-depression period indicated was somewhat near a normal.

What is meat for statistical hounds is sometimes only gristle for fact hunters, but there are the figures.

3. Exports

Net exports—that is, exports minus imports—also reached the zenith in 1929, with a total of 733,066 units. Then followed a slide to 119,699 in 1932, a comeback to 310,933 in 1934 and an estimated 370,000 in 1935.

In general, factors that will make for improvement in the home market in 1936 should also make for a better foreign market, inasmuch as the recovery process is just as widespread as the depression pattern was.

In the first ten months of 1935 aggregate exports of automotive products totaled $193,246,432, an increase of 12 per cent over the corresponding period of 1934. The increase should be greater in 1936.

There is no serious dissent to the prospect of improved automotive business in 1936. The favorable factors are:

Continuation of general recovery.
Probable increase in 2-car families.
More intensive use of cars at higher speeds and for greater distances.
Under-maintenance of depression period certain to show up.
Passage of bonus bill.

Unfavorable factors are:

Higher taxes may pinch buying power.
Present spirit of prodigality in government expenditures may precipitate general reaction and personal economy.
Nineteen thirty six market robbed of about 400,000 units by November shows.

In point of equipment, dies, tools, and fixtures, 1936 presents better prospects than 1935. Consider the position of the larger manufacturers:

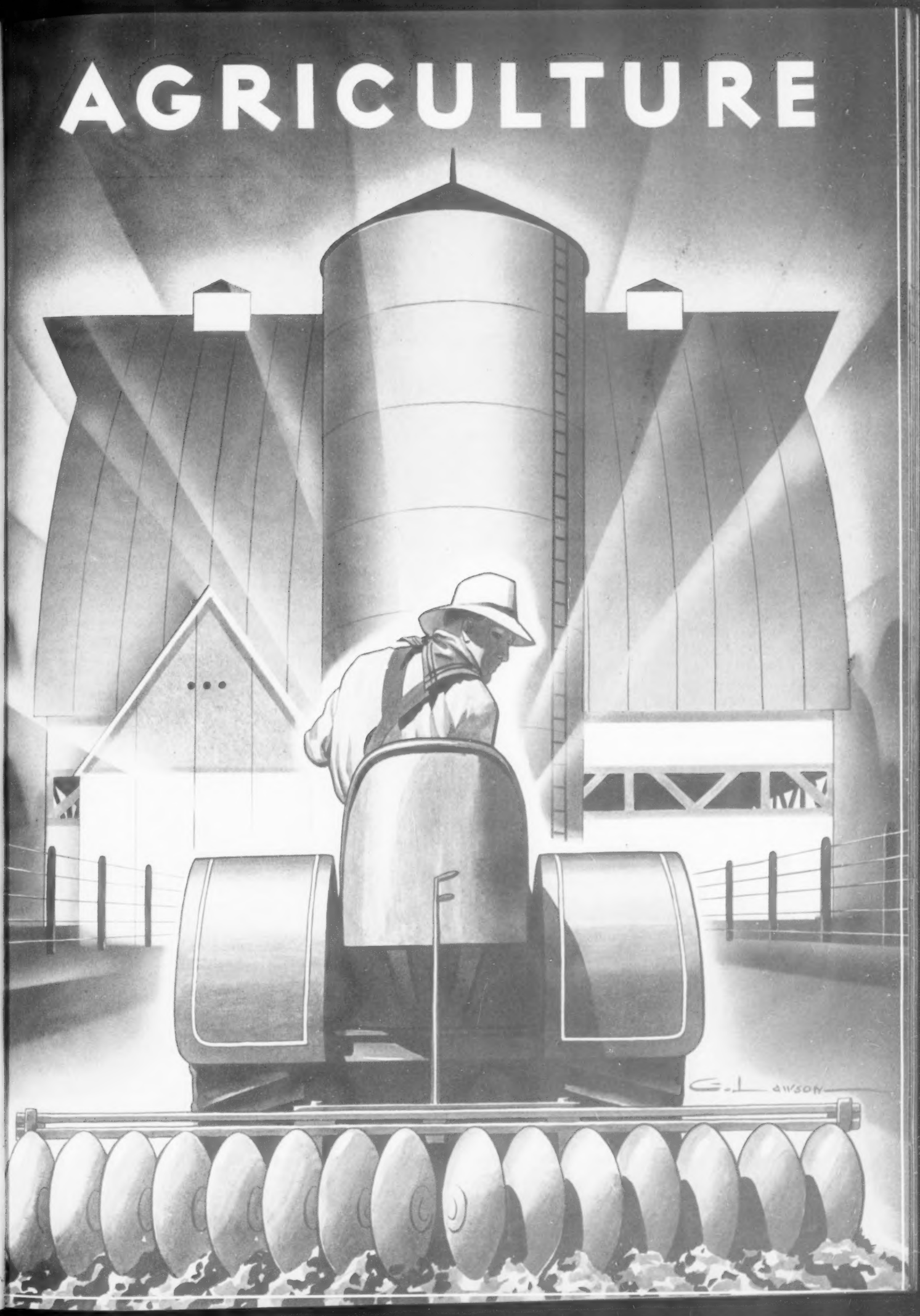
General Motors last year redesigned Buick, Cadillac, and standard Chevrolet. This year it will make the customary model changes on these lines, and is likely to increase its buying for revision of Olds, Pontiac, master Chevrolet, and LaSalle.

Chrysler made no fundamental changes in 1935; it is likely to in 1936.

Ford changes made in 1935 were minor. Model A came out in 1927, the V-8 in 1932, the march of progress at Dearborn is inexorable.

Hudson-Terraplane made important body and mechanical changes in 1935, and looms as a smaller buyer of new dies and tools this year.

The burden of evidence is that equipment buying will be appreciably larger in 1936, both for changes in design and to augment production facilities.


AGRICULTURE
G. L. LAWSON

Steel Recoups Farm Market as Income Rises

Expect Agrarian Outlets To Take 5,000,000 Tons in 1936; Implement Sales May Gain 20%

AGRICULTURE, the perennial national problem, took some encouraging strides last year toward its rightful place in the sun.

As the nation's No. 1 industry, comprising about one-fourth of the total population, agriculture exerts a profound influence on the welfare of this country. Steel is vitally interested in the farmer's prosperity because he offers a potential market for millions of tons of business annually.

The farmer received more for his products in 1935 than in any previous year since 1930. From present indications he will do even better in 1936. This should mean further additions to the heartening gains shown the past 12 months in sales of equipment, automobiles, and steel products in rural districts.

Steel has a big stake in this widespread market. Consider that usually about a fifth of the automotive and nearly all of the tractor production, about a third of the output of galvanized sheets and the large bulk of the barbed wire and fencing produced, have the farm as their ultimate destination, and the effect of variations in agricultural income on the steel industry becomes apparent. Including all manufactured products, it is likely that one-sixth of all rolled steel output ultimately finds its way to the farm.

Steel shortens the time between the grain field and the bread basket. This combine will harvest 4¼ acres per hour

Agriculture's depression experience was a disheartening one. Frequently at the mercy of nature's vagaries, the farmer is unable to regulate his production with the nicety of the manufacturer. Food consumption is fairly stable even in hard times, yet food prices fluctuate widely and sometimes at odds with variations in prices of the commodities the farmer must buy.

Prices of agricultural products dropped moderately in 1930 and sharply in 1931 and 1932, with a consequent shrinkage in farm cash income, as indicated in table 1. The relatively slower decline in prices paid by the farmer meant that there was an increasing margin between his receipts and expenditures, the difference being to his disadvantage.

Surpluses Gain as Exports Shrink

Farm cash income held steadily during the five years preceding the depression at about ten billion dollars. This declined two billion in 1930, and by 1932 had receded an additional four billion under the adverse effect of 30-cent wheat, $3 hogs, and sharp declines in prices of other products. Enormous surpluses of wheat, cotton, and hog products, plus losses of foreign trade, were important handicaps.

The index of farm prices in 1932 touched 65 per cent of the 1909-1914 base, while the commodities required for use in production on the farm and for family maintenance were bringing 107 per cent of the prewar average.

A moderate turn for the better occurred in 1933, when the farm price index rose to 70 and cash income increased from $4,328,000,000 to $5,117,000,000. Prices paid by the farmer gained only two points to 109. In 1934 the expansion was more rapid, farm prices gaining 20 points to 90 per cent of the base and narrowing the spread between this figure and

TABLE 1

	Farm Cash Income*	Prices Received by Farmers†	Prices Paid by Farmers‡
1925	$10,324	156	157
1926	9,993	145	155
1927	10,016	139	153
1928	10,289	149	155
1929	10,479	146	153
1930	8,451	126	145
1931	5,899	87	124
1932	4,328	65	107
1933	5,117	70	109
1934	6,387	90	123
1935 (Estimated)	6,800	107	125

Source: Bureau of Agricultural Economics, Washington.

*Millions of dollars.
†August, 1909-July, 1914 = 100.
‡1910-1914 = 100.

prices paid by farmers. The latter, in the meantime, had risen to 123, while cash income soared over a billion dollars to $6,387,000,000.

All three figures continued upward in 1935, estimates placing prices received at 107, prices paid at 125, and cash income at $6,800,000,000. In other words, since 1932 the prices received by the farmer for his products have risen nearly 65 per cent, while the cost of the commodities he buys—such as feeds, machinery, seed, fertilizer, building material, equipment and supplies, plus wages and expenditures for family maintenance — has increased only slightly less than 17 per cent. Parity between the two has not been reached and the farm problem is far from solved, but the situation price-wise is vastly improved compared with that of three years ago, and cash income has increased two and a half billion dollars.

IT SHOULD be pointed out that cash income includes the federal benefit payments. These amounted to $161,734,000 in 1933, $555,782,000 in 1934, and $464,000,000 for the first ten months of 1935. What influence the Agricultural Adjustment Administration will have upon future farm income is not clear.

Production control, instituted by this act, was intended to correct the discrepancy between farm and industrial prices. Along came the 1934 drought, and between nature and the AAA, both the farm-surplus and price situations were greatly changed. The carryover of grains and cotton was cut sharply to near-average levels. Hog mortality was greater than intended and scarcity prevailed.

The drought, worst ever recorded, had but little effect on farm income as a whole, however, due to the higher prices it helped to provide and to benefit payments and relief.

The farmer's purchases increased with his income the past three years, and in the former steel has shared. Farm equipment manufacture has recovered sharply from the depression low of 1932, domestic sales in 1935 being estimated at nearly three times the volume of two or three years ago. As shown in table 2, this represents the largest business in five years, though still far below 1929.

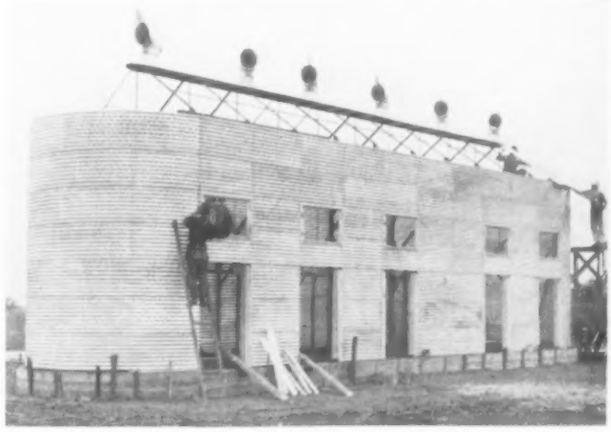
Index of domestic sales of the Farm Equipment institute, taking 1928-1930 as base, dropped from 110 in 1929, the all-time high, to 92.1 in 1930. The following year the index receded to 60.2 and in 1932 sunk to 28.3. Recovery to 29 in 1933 was insignificant. In 1934 the index rose to 48.4. Figures for 1935 are not yet available, but estimates made elsewhere point to an index of close to 80.

Natural obsolescence, new developments in farm machinery, and high cost of horse and mule power combined to translate markedly the rise in farm income into equipment purchases. While there was a lag in the gain in equipment buying in 1933, compared with the upturn in farm income, this is attributed to the desire to pay off old debts and to go slowly in acquiring new obligations. Implement sales the past two years, it will be noted, have increased more rapidly than cash income.

Gasoline Succeeds Mule Power

Tractors have been responsible for a large part of the recovery in farm implement production since 1933. When feed prices were low, many farmers turned to animals for power. In 1933 the annual cost of feeding one horse, based on average farm prices as of Feb. 15, was $21.80. A year later the cost was $48.56, in 1935 it was $83.31, and in the meantime horse and mule prices also had risen. When the economy faded, the tractor again came into its own, aided by the fact also that animal power was inadequate in many places.

Horses and mules on the farm have declined from 25,199,000 in 1920 to 16,662,000 today. During that period agriculture steadily has become converted to advantages of tractor power, and since ten years ago the number of units on



Storms, fire, and rodents never waste their talents on farm buildings with steel walls, steel roof, and reinforced concrete foundation

TABLE 2

Domestic Sales of Farm Implements

1925	$340,270,000	1931	$214,390,000
1926	364,751,000	1932	117,167,000
1927	391,868,000	1933	120,065,000
1928	402,872,000	1934	200,385,000
1929	458,091,000	1935 Est.	330,000,000
1930	381,099,000		

the farm has more than doubled, currently being estimated at more than 1,200,000.

It is not to be inferred that activity in the farm implement industry in 1935 reached boom proportions. For one thing, export sales have been slow to approach the $112,870,000 volume of 1929. Last year they totaled more than $30,000,000, against $21,500,000 in 1934.

FARM buying of wire products and galvanized sheets last year showed the largest increase since the turn of the depression. As in equipment demand, these purchases reflected the postponement of such buying during several previous years when repairs were neglected, or when, in instances, a cheap roofing was substituted for steel sheets, and barbed wire was made to be instead of woven fencing. Sales of barbed wire and fencing dropped sharply after 1928, as shown in table 3, which includes figures from STEEL's annual compilation of distribution of finished products.

From the 1928 peak of 538,766 tons, farm buying of wire products dropped to 110,849 tons in 1932, recovered briskly in 1933, but receded again in 1934 when sales were restricted in some areas by the drought. The 1933 gain also reflects heavy receipts by distributors near the end of the year in anticipation of price increases, since the trend in actual consumption was less abrupt. Expansion in buying in 1935 over 1934 ranged as high as 100 per cent in some districts, and for the country as a whole probably was well over 50 per cent. Heavy purchases by the government for rural projects helped to swell the total.

Farmers took 80 to 85 per cent of all galvanized roofing sold last year, and the total tonnage was substantially higher than in 1934. In 1932 agriculture accounted for only about 65 to 70 per cent of the roofing output. Figures shown in tables on farm consumption of galvanized sheets have been adjusted from mill reports on finished steel distribution in order to reflect the large tonnage which moves to the farm through the jobber.

LOOKING forward to 1936, favorable factors predominate the farmer's outlook.

Authorities believe crops safe from a repetition of the recent drought and that the moisture situation is satisfactory.

Excessive surpluses of grains and livestock that might exert a depressing effect on prices are lacking.

Hog production likely will be heavier to make up for the recent deficiency, with crops equal to, or larger than, those of 1935.

The winter wheat crop probably will be the largest in four years.

Long-range predicting with regard to agriculture is hazardous, yet there are expectations of at least a 10 per cent increase in farm income for 1936. Unexpected fluctuations in prices may have a considerable bearing.

Deferred buying of implements the past five years means that close to a billion dollars worth of potential business has accumulated, if the average for the preceding five years may be taken as normal requirements.

The farmer, in most cases, recognizes the importance of modern equipment as a means of attaining lower operating costs and may be expected to increase his purchases of machinery as rapidly as his finances will permit.

TABLE 3

Farm Purchases

(Gross Tons)

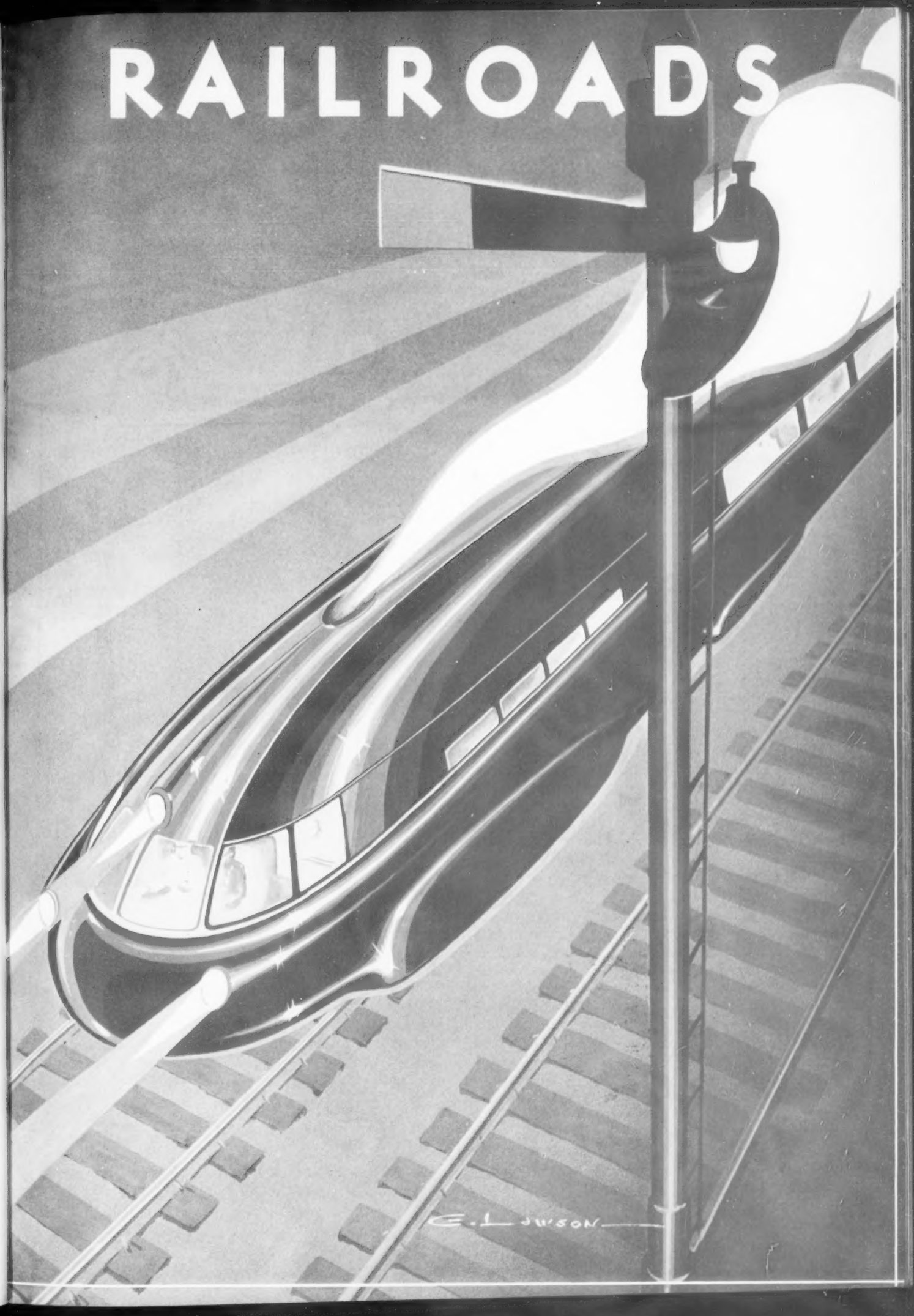
	Wire Products	Galvanized Sheets
1925	382,278	273,700
1926	404,886	327,215
1927	443,450	300,755
1928	538,766	446,040
1929	471,436	480,585
1930	360,766	332,377
1931	311,936	234,737
1932	110,849	135,897
1933	204,736	194,650
1934	116,691	249,827

The better income of 1935 and continuation of favorable conditions this year should result in a further upturn of about 20 per cent in 1936 implement sales.

A similar gain in purchases of other steel products seems a logical expectation. The important points to be observed are that farm income has risen to a level that provides a surplus for the making of necessary expenditures, and that the restricted buying during depression years accentuates need for replacement.

The implication, so far as agricultural consumption of steel is concerned, extends beyond the prospective betterment in implement, wire and sheet demand. Bolstering the earnings of the 32,500,000 members of the farm family will benefit steel use in a myriad of directions.

Including wire products, sheets, tractors, implements, automotive vehicles, containers, dairy equipment and other manufactured products, it is probable that agriculture accounted for 4,000,000 tons of rolled steel in 1935. That this figure will be swelled to nearly 5,000,000 tons in 1936 appears conservative.


RAILROADS
E. L. JWSON

Equipment Buying Is Near as Railroads Profit

See Standard Freight Cars Ordered First; $200,000,000 To Be Spent For Rails, Supplies

MAKE no mistake, the railroads are coming back. Notwithstanding the ascendancy of other forms of transportation—forms that are in the line of progress and hence ought not be retarded even if they could be—the railroads will fill a very definite need for certain services at least within the lifetime of living man.

A little later than most other basic industries, the railroads have turned the corner; they appear to have turned it in the closing quarter of 1935 in point of net income, freight traffic handled, equipment orders, and a general awakening from the stupor of depression. As a consequence, they will be better customers of the iron and steel industry this year, principally for equipment.

Prior to 1920, or the time when the automobile attained maturity, the railroads were preeminent in the consumption of steel. They connoted steel. The sleek, swift passenger train, the long freight drag, the well-groomed right-of-way were the most visible forms of steel. The new era in railroading dawned in 1920, and for a background of the railroad situation today, consider the events of the past 15 years.

UNLIKE other leading consumers of iron and steel, the pre-depression period for the railroads was not an irresistible sweep, like the rush of a mighty wave, only to break on the rocks of 1929 and silently but dangerously ebb out to sea as the undertow. The railroads reached their zenith long before 1929.

The peak year of their consumption of steel was 1923. That also was the year in which they installed the most freight cars and locomotives and set an all-time record in capital expenditures. In 1926 they installed the most passenger cars, laid the most miles of main track, took the largest tonnage of rails since the record of 1906, and handled the most freight. The banner year for passengers carried was 1920. So, by the time other industries scaled the peak of 1929 the railroads were part way down the other side.

The collapse of other industry, of course, accelerated the slide in transportation. The low point from the standpoint of use of steel, though by no means the turning of the corner, occurred in 1933. No wonder the production of steel reached the vanishing point when so important a customer reached so low an ebb in 1933: 1879 freight cars installed, compared with 196,336 in 1923; 36 miles of main track laid, contrasted with 1527 in 1926; 25 new passenger cars put in service, against 4360 in 1923; 29,220,052 cars of freight loaded, barely half the record of 53,098,819 in 1926.

The statistical picture of the railroads for the period 1920-1935 is given in the accompanying large table. Supplement this with an insight into the drastic economy enforced in the maintenance of equipment and way, and also the modest but encouraging recovery:

	Expenditures for Maintenance of Equipment	Expenditures for Maintenance of Way
Average 1925-29	$1,226,366,000	$849,021,000
1930	1,019,265,000	705,471,000
1931	816,953,000	530,613,000
1932	618,941,000	251,077,000
1933	598,709,000	322,286,000
1934	637,906,000	365,300,000
1935*	671,110,000	391,869,000

*November and December estimated.

THE first eight months of 1935 were gloomy for the railroads. Month after month returned only a deficit after charges, notwithstanding a volume of freight business that was the equal of 1934 and an increase over 1933 and 1932.

In September came a change—a net income of $13,542,934 after charges. October did considerably better, turning in a net income of $31,608,777. This left the net deficit for the opening ten months of last year $35,000,000,

compared with a deficit of $31,000,000 in the corresponding months of 1934 and $32,000,000 for all 1934.

While final figures for November and December are not yet available, there is reason for believing that the net income of these months was sufficient to wash out the deficit of the preceding ten, and that if 1935 did not finish in the black the red was very pale.

What happened in the closing months of 1935 was that the carriers, their expenses stripped to the bone, were benefiting from a moderate increase in volume. This augurs well for 1936, inasmuch as even a slight further improvement in carloadings will register disproportionately high in net income.

The question whether the financial experience of the railroads will be better in 1936 answers itself. If more automobiles are built, if more containers are marketed, if building snaps back, if crops are larger, if the Hull trade agreements stimulate foreign trade—then railroad traffic will expand. It will not only expand, but also ease the financial tension and permit the long-deferred replacement of equipment.

It can, of course, only be surmise, but there is a body of opinion to the effect that, if building regains anything approaching normal volume, the additional bulk building materials the railroads will be required to handle will greatly offset the loss in traffic to trucks, and that this haul of building material plus the irreducible minimum of other traffic they have retained will put railroads comfortably into the black.

Refer to the large table just below and note the progressive decline in purchases of new freight cars and locomotives and also in freight car ownership. Even this leaves part of the story untold, for approximately 600,000 of the 2,000,000 freight cars now in service are over 21 years old. Of the 47,000 locomotives now hauling trains on Class I railroads, 61 per cent are over 20 years of age. On thousands of cars idle but recorded as serviceable the deterioration through nonuse has been crippling. For a few days last fall there was a slight indication of car shortage at points of dense traffic, and a 10 per cent improvement in carloadings this year would tax facilities severely.

Many Ways To Finance Are Open

The need for equipment being patent, the question arises, can it be financed? It can, by:

1. Loans from the Reconstruction Finance Corp.

2. Loans from the Public Works Administration, these being even cheaper than from the RFC for the reason no interest is charged the first year.

3. Flotation of equipment trusts. As a rule, equipment is its own collateral, and practically no money has ever been lost by investors in this class of security. An eastern road recently placed some trusts at 2¾ per cent.

4. One of numerous plans for private-financing being developed in Washington. One typical plan calls for scrapping 600,000 cars now over 21 years old and replacing them by a 4-year program involving construction of 90,000 new cars annually, to be paid for on a basis equivalent to a per diem rental of $1.

Even though some 68,000 miles of railroad, or more than one fourth of the country's mileage, is in receivership—most of it in the benevolent arms of the revised federal bankruptcy laws—this is no deterrent. In fact, it may accelerate buying, inasmuch as surcease from interest payments releases funds.

A new type of equipment which promises to

Vital Statistics of American Railroads Since 1920

	Equipment Installed			Miles of Main Track Constructed	Freight Car Loadings	Rails Produced Gross Tons	Freight Car Ownership Class I Roads	Locomotive Ownership	Capital Expenditures 000 omitted	
	Freight Cars	Passenger Cars	Locomotives							
1920	36,044	621	1,017	414	45,118,472	2,604,116	2,322,122	64,746	$653,267	1920
1921	63,406	1,681	1,330	642	39,323,158	2,178,818	2,315,692	64,949	557,035	1921
1922	105,394	1,328	1,228	543	43,207,561	2,171,776	2,293,392	64,512	429,273	1922
1923	196,336	2,658	4,360	1,176	49,812,113	2,904,516	2,368,876	64,659	1,059,149	1923
1924	156,390	2,755	2,786	1,114	48,534,433	2,433,332	2,404,528	65,062	874,744	1924
1925	128,422	3,230	1,600	1,354	51,224,152	2,785,257	2,442,824	64,357	748,191	1925
1926	104,000	3,455	2,400	1,527	53,098,819	3,217,649	2,437,494	63,107	885,086	1926
1927	75,386	2,646	1,950	1,253	51,635,806	2,806,486	2,419,802	61,540	771,552	1927
1928	58,395	2,524	1,400	1,342	51,589,887	2,647,493	2,392,267	59,769	676,665	1928
1929	84,894	2,663	775	897	52,827,925	2,722,138	2,361,638	57,482	853,721	1929
1930	76,909	1,900	790	845	45,717,079	1,873,233	2,369,178	56,287	872,608	1930
1931	12,662	697	150	861	37,151,249	1,157,751	2,316,065	55,029	361,912	1931
1932	2,968	579	65	168	28,179,952	402,566	2,245,759	53,193	167,194	1932
1933	1,879	607	25	36	29,220,052	416,296	2,156,515	51,058	103,947	1933
1934	24,103	703	75	80	30,785,594	1,010,224	2,040,446	48,210	212,712	1934
1935	4,792*	415**	31*	58*	31,300,000†	710,000	1,944,543	45,821	310,000	1935

*10 months. **9 months. †Late December estimated.

Records of the Committee on Public Relations of the Eastern Railroads include rebuilt equipment returned to service. The Association of American Railroads lists only actual new equipment installed, and so far as possible its statistics are given above.

assume major interest for steelmakers, though probably not in 1936, is the container. It is a favorite with the federal co-ordinator of transportation, and surveys are being made to ascertain probable use in industry.

These containers are of two types—inner and outer. Their claimed advantages are: (a) Reduce costs of packing, handling, loading, unloading and storing goods; (b) provide shipping units of sizes and designs suited to modern commercial needs; (c) avoid breaking bulk in all movements between origin and destination; (d) provide maximum security to lading in handling and transportation operations; (e) reduce idle time of all forms of transportation equipment.

Urge Interchangeability with Trucks

The ideal future freight car—if it can be termed a car—is a chassis on which would be mounted from one to five or six containers, these containers being lifted from the chassis by cranes directly into the consumer's plant or to motor trucks. These containers would be built of the new special alloy steels.

The inner type of container would be of a size to fit into outer containers, or it might be a skid, pallet, or trailer easily handled by lift trucks. The maximum height of a load so carried would be 6 feet, and the maximum weight 6000 pounds.

Many railroad executives are skeptical of the value of this type of equipment, and both they and shippers need to be sold the idea. However, the best transportation brains in Washington, and they are not necessarily new dealers, believe that truck competition can be met only by more mobile equipment or a co-ordination of rail and truck. There is some opinion that railroad opposition to this development is ill-founded, and failure to modernize may be fatal to private ownership.

Typical of the trend in passenger equipment is the Mark Twain, a 4-car stainless steel, diesel-powered train built for the Burlington railroad by Edward G. Budd Mfg. Co.

SPECIFICALLY, what is the prospect for 1936? The man in Washington best equipped to estimate states that railroad buying in 1936 will be 10 to 20 per cent greater than in 1935. For the base on which to apply this forecast consider that freight car orders (different from actual installations) last year approximated 21,000 units, and rail orders 500,000 tons.

In 1934 railroad purchases of materials and supplies, as distinct from equipment but including rails, totaled $600,224,000, of which $159,758,000, or 27 per cent, was for iron and steel products. The estimate of such purchases for 1935 is $700,000,000, of which probably $183,000,000 was for iron and steel. A 10 per cent increase this year would indicate an outlay of $200,000,000 for rails, wheels, axles, tires, track fastenings, boiler tubes and flues, machinery, locomotive castings, bolts, nuts, washers, rivets, springs, etc.

This Washington expert forecasts:

Roadbeds having been maintained in relatively better shape than equipment during the depression period, expenditures for them will not increase proportionately to other items.

Most freight car orders in 1936 will be for orthodox types, though the trend will be toward the use of the new medium-price steel alloys and all-steel equipment.

Containers will not be accepted by the railroads sufficiently to make them a tonnage outlet for steel this year.

No large-scale electrification will be undertaken.

Steam locomotives will hold their own.

There will be a distinct trend toward the self-contained single-car train for branch line service.

AN EARNEST of improved business for 1936 is seen in these programs, which either are in prospect or have recently matured and will be consummated this year:

Pennsylvania, construction of 10,000 and conversion of 1000 freight cars, at a cost of $30,000,000; Union Pacific, rebuilding freight cars, $4,000,000; Burlington, construction of 1200 freight cars; Southern Pacific, $1,000,000 for air-conditioning passenger cars; Missouri Pacific, to buy 4000 freight cars; Missouri-Kansas-Texas, to buy 1000 freight cars; New York Central, repairs to 1500 freight cars; Illinois Central, reconditioning unstated volume of equipment; Frisco, repairs to 500 hopper cars and reroofing 600 box cars.

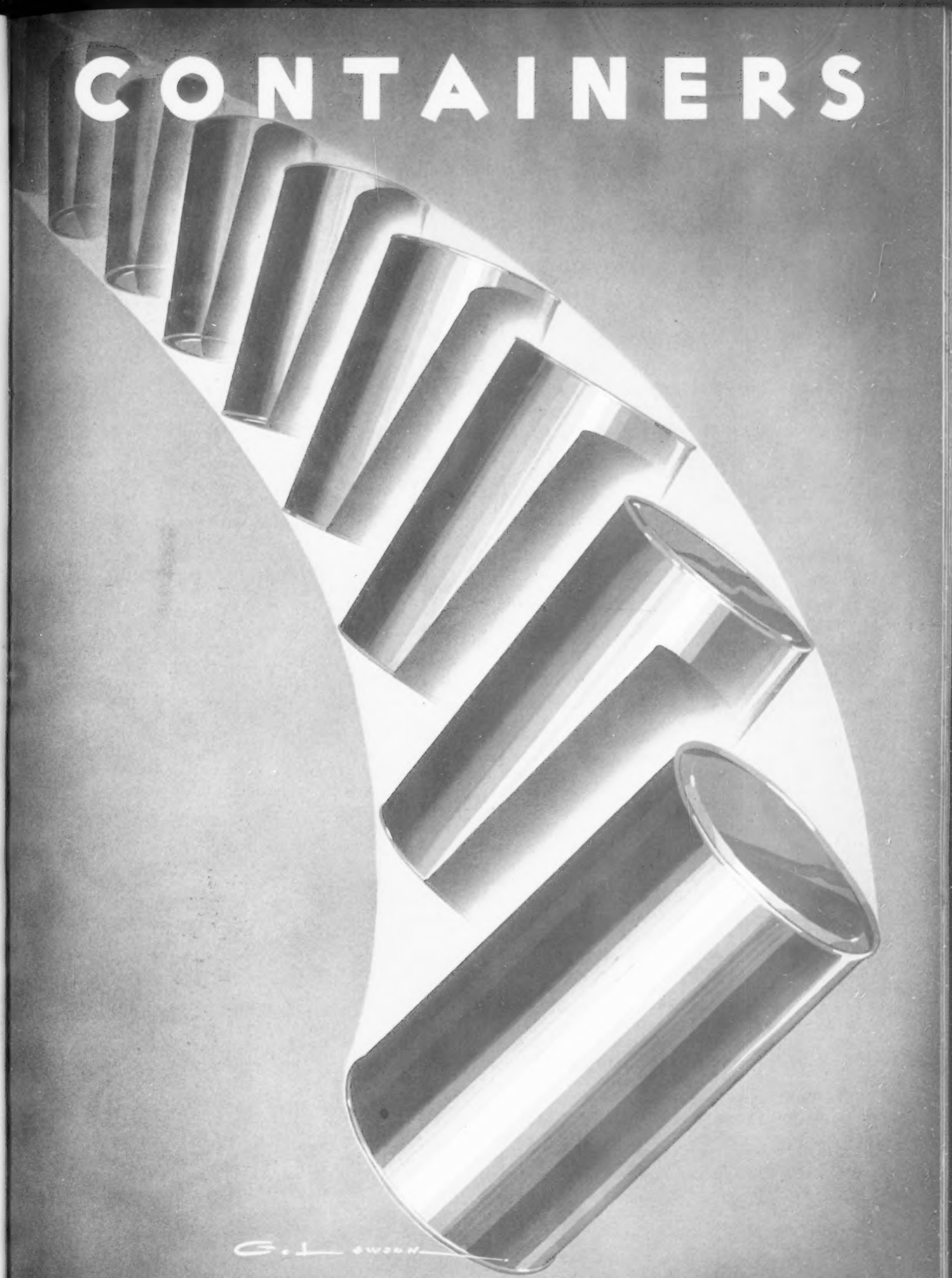
Steel requirements for freight cars are:

Standard all-steel box car—8 to 10 tons of rolled steel, plus 2 tons for axles; 1500 pounds of castings; 500 pounds of forgings.

Wood box car—same as above except 1 ton less rolled steel.

Gondola—10 to 12 tons of rolled steel; 1500 pounds of castings; 500 pounds of forgings.

CONTAINERS



Trend to Cans for Beer, Oil Spurs Tin Plate

1936 Output May Top 40,000,000 Boxes as New Uses Supplement General Packers' Line

TIN plate consumption made a rapid comeback in 1935 and was at the highest for any year since 1929. Moreover, the 1936 outlook is extremely bright—probably the most encouraging in a decade—because of the new markets opening up.

Between 85 and 90 per cent of all the tin plate produced in this country goes into containers. By containers are meant not only the popular conception of the round-bottomed, cylindrically-shaped "can," but also a myriad of other shapes in square, rectangular, and other shaped boxes, cans, and holders of materials and commodities for store, ranging from conventional packers' cans to beer and automobile antifreezes.

The insignificant remainder, not much more than 10 per cent at best, goes into a variety of other uses, such as bottle caps, toys, clocks, bottle seals and mailing checks. But, as the container business goes, so goes tin plate. Any consumer taking 90 per cent of an industry's output does more than exert trends; it dominates.

Requirements Are Fairly Steady

Tin plate—and of course also, tin cans—are, according to an old axiom, depression boomsters. Their use always shows up in poor times, because their need is a steady necessity, hence does not fluctuate, and consequently tin plate did not take the nosedive the capital goods' outlets for steel did in the early thirties. On the other hand, at no time in the last decade has tin plate consumption made any exceedingly marked gain in one year over another.

Starting in 1925, and to review consumption in each intervening year, uses for tin plate accounted for approximately 32,000,000 base boxes. The next year it was 34,000,000 base boxes, followed by 33,000,000 boxes, 36,000,000 boxes, and in 1929, 38,000,000 box units. A box weighs 100 pounds.

In 1930 the consumption of containers began to drop, so that 34,000,000 base boxes were required, followed by 29,000,000 in 1931, then a low since 1914 was recorded in 1932 when 21,000,000 base box units were used. The next year, 1933, a sharp upswing accounted for 34,000,000 base boxes, followed by 31,000,000 in 1934, and an estimated 39,000,000 in 1935.

Thus it can be seen that, barring the one standstill year of 1932, tin container uses in this country have accounted for no less than 31,000,000 base boxes per year and no more than 39,000,000 units. Translated into tons this means a fluctuation of between 1,500,000 and 2,000,000 tons of a finished steel product. Few other finished items have been so steady.

Containers Take Larger Percentages

Related to total steel production, obviously such a stable item shows up in varying degrees, but better in dull times. In 1929 containers accounted for 4.67 per cent of all finished steel made; in 1930, 5.77; in 1931, 7.90; in 1932, 10.79; in 1933, 12.25; in 1934, 8.68; and in 1935, probably between 8 and 9 per cent.

The 1935 record will show that about 43,000,000 to 44,000,000 base boxes will have been made, which, less producers' stocks held unshipped at the end of the year amounting to some 4,000,000 base boxes, will leave a conservative estimate of actual consumption of 39,000,000 base boxes, or around 1,800,000 tons. Related to a total steel production of 34,000,000 tons of ingots (less 20 to 25 per cent losses in conversion) containers will account for about one ton of steel in every 12 made, or something close to the 1934 percentage showing.

For 1936 conservative forecasters agree that container consumption of steel augurs exceedingly well, and this despite the large carryover of finished tin plate in the hands of tin plate mills awaiting shipment to the canmakers. For one thing, in 1936 the growing use of general-line cans for multitudinous uses

and the lusty infant found in so packing beer, ale, and wine should account for a consumption well up in the high thirty-millions of boxes, per haps over forty millions.

SO MUCH for the total steel consumption of the container industry in its relationship to all of the steel industry. But steel is interested in surveying the magnitude of this major outlet for its product.

The container industry is not an old one, and dates its inception virtually to the early years of the present century. Over the ensuing 35 years the number of canmaking establishments has steadily been reduced in number, although number of employes has been on the uptrend, as have wages and the value of products.

In 1904, the first year the census of manufactures recorded figures for the container industry, there were 377 establishments, having 16,919 employes to whom was paid some $6,842,491 in wages and who converted $26,248,253 worth of materials into a product valued at $41,892,809.

An Industry That Has Recovered

By 1925 this industry had declined to 221 establishments, but employing 29,901 persons to whom were paid wages of $34,391,598. The cost of materials used in that year was $175,778,593, which finally emerged as product valued in aggregate at $260,359,961.

In 1929 the container industry had still fewer manufacturers as the two leaders—American and Continental Can Cos.—gained further ground through mergers and consolidations with smaller units, plus their own individual growth. Six years ago, therefore, there were 232 makers with 31,497 employes to whom was paid a total of $38,173,246 in wages. Cost of materials—almost entirely the 38,000,000 base boxes of tin plate used—was $194,986,803 in that year, and the value of the output $296,901,426.

Two years later, in 1931, and feeling the effects of depression, the container industry listed 199 manufacturers, 25,271 employes, wages of $27,977,932, a materials' cost of $149,121,078, and a total product valued at $223,634,271.

The census of manufactures for 1935 has not yet been compiled, but it will show a further decline in the number of container-manufacturing concerns, a pickup in the number of employes to a level approximately that of 1929, and a rise in payrolls close to $38,000,000.

Furthermore, since tin plate prices today are almost the same as they were in 1929, the materials' cost item will be back close to the 1929 level of $194,000,000-odd, and the value of all containers made in the year will near the $300,000,000 mark.

The 1935 season in "packers cans"—that is, those containers for vegetable and fruit packs and therefore the bulk of the business—improved markedly over 1934. In 1934 the influence of the drouth not only cut down the pack but also prevented free movement of canned goods into consumption in view of considerable hoarding against possible shortages.

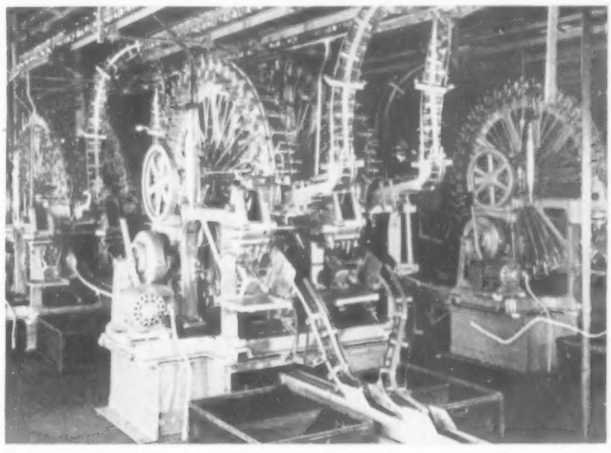
In spite of the gains in container production, finished canned goods stocks are only up slightly.

The three major vegetable packs, corn, peas, and tomatoes, are shown in statistical record over the past six years:

(Unit: 1,000,000 cases)

	1935	1934	1933	1932	1931	1930	1929
Corn	20.0	11.3	10.2	9.4	19.4	15.7	17.5
Peas	24.6	15.7	12.9	10.4	13.3	22.0	18.5
Tomatoes	16.1	13.1	12.0	16.0	9.6	17.0	14.1

In addition to the recovery shown in packers cans, the container industry has developed a marked comeback in "general-line" cans, the other important branch of this business. In this classification, the oil and varnish trades are the largest users.



The last step before a can becomes a container is testing it under air pressure. Photo courtesy Continental Can Co.

A product of the depression is the growth of use of general-line cans by oil companies which formerly had sold their output in barrels. It is estimated now that more than 200 oil companies have gone to cans.

The general-line can business probably cannot look to much of a meat pack in 1936, not as much in fact as the meat-packing and hog-slaughtering program of the federal government provided in 1934. But in its stead in the general-line can end of the business is the beer can, the container industry's most promising infant.

AFTER experimenting with the idea for seven years, and intensively so for the last two or since repeal set in, the container industry in 1935 launched the most promising new use for tin plate developed in a decade. This was in containers for beer and ale.

Because of its sanitary advantages, impervi-

ousness to light and therefore to deterioration, because of its easy handling, light weight, and convenience, tin beer containers are definitely a growing usage. So much so that interested parties are beginning to figure how much beer will eventually come to be canned in 1936, and even in later years.

Last year American breweries sold approximately 46,000,000 barrels.

Had all of this beer been placed into cans it would have accounted for 11,000,000,000 tin plate units. However, about 70 per cent of all beer made is placed in kegs, chiefly wood, and sold as draft. The remainder, or 30 per cent, is packaged. However, this percentage distribution between draft and packaged beer is tending to change, with draft beer losing.

Potential Demand Exceeds Plate Capacity

Nonetheless, to consider the 1935 showing, the 30 per cent meant a market of about 3,500,000,000 potential beer cans. For this market steel and glass are fighting. Glass once enjoyed an absolute monopoly; now the use of steel is strongly in the ascendancy.

Three and a half billion cans of bottled beer yearly would mean 7,500,000 base boxes of tin plate, or 375,000 tons of finished steel. Such would have been the 1935 showing with a 100 per cent use of tin plate containers. For 1936, estimates now run as high as a domestic consumption of 55,000,000 barrels. If packaged beer should garner a heavier share than its former 30 per cent of this total and if, in turn, steel should overtake and pass glass—and these are two presumptions more in the realm of likelihood than possibility—as much as 12,000,000 to 15,000,000 base boxes of tin plate might be required, meaning in turn 600,000 to 750,000 tons of steel.

This much tin plate would far exceed the present capacity of American mills to produce, that is, in addition to other general-line and packers' can requirements. The present capacity of American mills is about 54,000,000 base boxes of tin plate annually, but this is inclusive of the output of a number of abandoned and obsolete mills which will never be operated again. It is also based on absolute 100 per cent operations for a whole year, which also is not feasible.

But at $5.25 per base box, or $105 per ton, these 600,000 to 750,000 tons of tin plate would mean $60,000,000 to $75,000,000 additional product output to add to the estimated value of 1935's container industry output of some $300,000,000.

Public Takes Rapidly to Canned Beer

The 1935 beer can record, actually, was as follows: About one volume of 1935 packaged beer in every eight sold was in tin plate. In other words, this lusty infant, starting on the market late in the first half of the year, by the year-end took 12 to 13 per cent of the glass industry's share. About 500,000 base boxes, or 25,000 tons of steel, were actually utilized for beer containers in 1935.

For one thing, a drawback in more rapid progress in 1935 was in getting machinery and equipment installed soon enough among the canmaking plants. In many cases expensive glass bottling machinery, bottle cleaning machinery, and other like investments had to be written off. Public favor had to be won and many breweries were slow to become converts.

By last September the total capacity of all canmakers engaged in making tin beer containers was approximately 50,000,000 cans per month, or at the rate of 600,000,000 annually. However, this figure grew rapidly and at the year-end both the American and Continental Can Cos. had the facilities to make them in aggregate at the rate of 3,000,000 daily, or 60,000,000 per month.

AMERICAN and Continental are the leading makers of tins for beer. Each has developed a type of container. The American can is 4¾ inches deep and 2⅝ inches diameter, cylindrical in shape and made of 107-pound tin plate. The Continental type is approximately to the same dimensions, barring a throat-shaped top, which, complete with a cap resembles a bottle. It takes about two base boxes of tin plate, or 200 pounds, to make 1000 cans according to the American design and about 2¼ base boxes to make 1000 of the Continental container.

Many well-posted observers of this rapid growth in containers state that it would be conservative to expect that the use of tin plate will rise to 25 per cent of the total of all packaged beer sometime in 1936. On the other hand, others expect that within another year—or possibly longer—at least until present glass-bottle-making investments can be written off, that tin plate will have entirely replaced the glass container.

Many breweries have already signed long-term contracts with either Continental or American. One, such as the Pabst contract, is for ten years and at present calls for 500,000,000 cans yearly. This contract has flexible features and doubtless will be increased.

Many contracts these two canmakers are entering into at present are on a trial basis because of what they term the variable character of the market. Many breweries are not yet certain as to what size the market will develop. Some say that doubtless by spring of 1936 there should develop better signs of how large the potential market will be. So far though, neither Continental nor American has been able to supply all of the breweries with their immediate with their immediate needs.

AIR CONDITIONING
APPLIANCES
EXPORTS
PIPE LINES
MACHINERY

Home to Use More Steel; Export Gain Seen

Machine Buying Promises Upward Swing; Pipe Prospects Show Larger 1936 Tonnage

STEEL has been entering into household use in the past decade to a greater degree than is generally recognized. Metal utensils and utilities a generation ago were largely of cast iron or nonferrous metals, including cooking and heating stoves and the various smaller articles, principally for the kitchen.

With the advent of the gasoline and, later, the gas stove, more steel began to enter into residential use. The gradual increase in this outlet absorbed a tonnage which gave it position among the first dozen users of steel in volume. Statistics gathered by STEEL segregated figures of distribution for furniture, furnishings, stoves and other household utilities first for 1928. The total then was stated as 621,280 tons, 2.18 per cent of the total tonnage. This was increased to 927,713 tons in 1929, which was 2.56 per cent of the total.

In spite of frozen assets and disappearing fortunes of the householder, in 1930 total steel consumed for household use was 801,816 tons, some 3.11 per cent of total steel output. Thus it appears that steel for this use suffered less than for other classes. In 1931 the decline was into such use in 1935 is about 750,000 tons.

An all-steel kitchen, even the chair. Courtesy General Electric Co.

From the low point in 1932 recovery was sharp in 1933, to 508,378, accounting for 3.70 per cent of the total and to 497,840 tons in 1934, at 3.77 per cent. Tonnage of steel going into such use in 1935 is about 750,000 tons.

Mechanical refrigeration, using electricity or other power, has proved one of the large outlets for steel in the household. As an important consumer of steel this dates back to about 1929, when statistics of its output first were collected.

By July 1, 1934, the industry had placed 5,900,000 units of household refrigerating, which, at an estimate of 190 pounds of steel in each, gives a total of 560,000 tons.

Mechanical Refrigerators Sell into Millions

Figures of installations start at 630,000 in 1929, rising to 775,000 in 1930, dropping to 965,000 in 1931 and to 770,000 in 1932. This was the low point, and in 1933 sales rose to 1,065,000 and in 1934 to 1,400,000 units. The upward swing has continued through 1935, and the first nine months shows sales of 1,529,552 units. If this rate continued to the close of the year, by applying the factor of 190 pounds of steel for each, a total of 193,742 tons of steel was required.

If the increase of 25 per cent in sales for 1936 over 1935 is realized the tonnage of steel required to meet the volume of sales would be increased by close to 50,000 tons, to about 240,000 tons.

A newcomer in household equipment which bids fair to grow into a giant in the use of steel is air conditioning. This calls for sheet steel in various grades, pipe and light shapes. While air conditioning in public, industrial and commercial structures has been growing to large proportions application of the same principles on smaller scale is being made to residences.

It has been estimated by the American Iron

and Steel institute that more than 600,000 tons of steel has been used in installations now in service, that in 1934 installations consumed 28,000 tons of steel, and that within the next ten years 450,000 tons of steel will be required annually to meet this demand.

Of all the household appliances of major size the housewife has taken most enthusiastically to the washing machine. As a wife saver it occupies a position second to none and while first efforts along this line were largely of wood and required considerable manual exertion inventive genius recognized the wide field and soon adapted steel and mechanical power, with the result that sales increased apace.

As far back as 1919 over 500,000 machines were sold, with 600,000 in 1920 and 300,000 in 1921, a low point. From then forward to 1929, with scarcely a regression, the total climbed to 950,000. From that point sales declined to a low of 550,000 in 1932, snapped back to 940,000 in 1933, to 1,240,000 in 1934 and 1,241,606 in ten months of 1935.

If that rate continued through 1935 the total was close to 1,500,000 for the year. At the estimate of 150 pounds of steel in each machine the total required for the 1935 output was close to 110,000 tons.

Pipe Needs for Water, Gas, Oil, Promise Large Gain

CONSUMPTION of steel by oil, gas, and water lines is in somewhat the same situation, in the long view, as exists in the market for steel rails. Oil and gas lines, essentially subterranean transportation systems, cover present needs, but changes in distribution plans of producers and wider use of natural gas offer a further outlet for steel in pipe lines.

Demand for casing pipe probably will increase as many wells are being deepened and prospecting is also under way, as always. In the process of deepening wells an entirely new well is drilled close to the older one and, according to its depth, larger casing is used than in the original hole.

Tracing the history of the oil and gas lines and casing demand since 1922 presents an interesting picture. In 1922, steel consumed in oil, gas, and water requirements, largely for the first two, totaled 3,384,500 tons, and in 1923 it was 3,232,000 tons. This represented heavy demands for oil pipe lines from the Mid-Continent oil field to Chicago refineries.

The next five years, including 1928, absorbed slightly over 2,000,000 tons per year. In 1929 requirements took 3,259,229 tons, an increase of practically 1,000,000 tons over the preceding years, brought about by natural gas lines from the Texas panhandle to Chicago and Indianapolis and by some lines in the Southeast.

From that time tonnage fell off rapidly until a low was established in 1932 of 512,936 tons.

This kind of pipe consumes large steel tonnages in long water lines. Courtesy Lincoln Electric Co.

In 1933 this rose to 671,232 tons and in 1934 to 789,284 tons.

In 1922 oil, gas, and water lines consumed 14.84 per cent of the total output of steel, and in 1923 they took 10.60 per cent. For the next five years their needs represented 7 to 8 per cent, which in 1929 rose to 9.01 per cent and for the next two years continued between 9 and 10 per cent. At the low point in 1932 these lines took 5.50 per cent, and in 1933 and 1934 their requirements were 4.88 and 4.97 per cent.

Careful estimates of the tonnage of steel going to these outlets in 1935 makes it apparent that about 890,000 tons have been consumed. For 1936 it is difficult to gage the needs of so many widely spread interests but it appears within the bounds of probability that more than 1,000,000 tons will be required, with the possibility of even more.

Machinery Requirements Heavy as Equipment is Outmoded

DEMAND for steel for building machinery has followed much the same curve as that for other departments of industry. Consuming 645,200 tons in 1922 and 766,650 tons in 1923, it took slightly less until its needs were satisfied by 545,497 tons in 1927.

In 1928 a bulge to 1,003,090 tons and in 1929 to 1,375,571 tons marked the top of the movement, and a decline to 315,577 tons in 1932 was the bottom. In 1934 machinery needs took 579,185 tons and it is estimated, on the basis of actual improvement, that close to 800,000 tons was used in 1935.

Machine tools and forging machinery statistics follow much the same curve as tonnage for all machinery, and needs for modernization indicate a fairly sharp upturn in 1936 to replace obsolescent equipment with which prac-

tically all industry is burdened. Use of welded steel for machinery bases is making gains.

A movement is well under way to modernize so far as possible the machinery equipment of the army and navy, and some appropriations for this purpose are on the way. Another fertile field for a broad program of modernization is in railroad shops, which are much run down.

Careful estimates of probable growth in machine tool sales for 1936 indicate an increase of at least 30 per cent, which is regarded as conservative. This would carry total steel needs for this purpose somewhat over 1,000,000 tons, close to the total for 1928.

World Demand for Steel Presages Heavier Exports

AN UPWARD trend in steel and iron exports of the United States, starting in 1933, promises to continue in 1936 and bring a tonnage in excess of the estimated 1,000,000 gross tons of steel and iron products exported in 1935. This is exclusive of scrap, which it is estimated totaled 2,150,000 gross tons in 1935.

Statistics show an interesting situation in the export field for steel, as outlined in the accompanying chart. In 1920 exports totaled 4,931,146 gross tons, of which only 219,250 gross tons were scrap. This apparently was due to heavy buying for the rehabilitation of European countries. Conditions of worldwide trade and partial filling of the needs in Europe caused a sharp drop in 1921 to 2,212,318 gross tons, of which only 37,117 tons was scrap.

This apparently was what might be called a normal level for the times, and remained slightly above or below 2,000,000 tons for seven years. The first major upswing came in 1928, to 2,862,997 gross tons, followed by a second step in 1929 to 3,032,352 gross tons.

In 1930 the effect of the world monetary collapse cut world trade sharply and United States exports fell to 1,985,025 gross tons. This was followed by a sharper shrinkage in 1931 to 965,268 gross tons, and in 1932 to 594,650 gross tons. This figure represented almost a disappearance of foreign trade in steel by the United States.

In 1933 exports rebounded to 1,350,692 gross tons, in 1934 to 2,832,764 gross tons, and in 1935, with two months estimated, to 3,150,000 gross tons. The above figures are by the metals and minerals division of the bureau of foreign and domestic commerce of the department of commerce.

While total exports of steel and iron are of interest it is well to consider the tonnage with scrap excluded, as this represents the products on which labor is expended, thus contributing to the activity of industry.

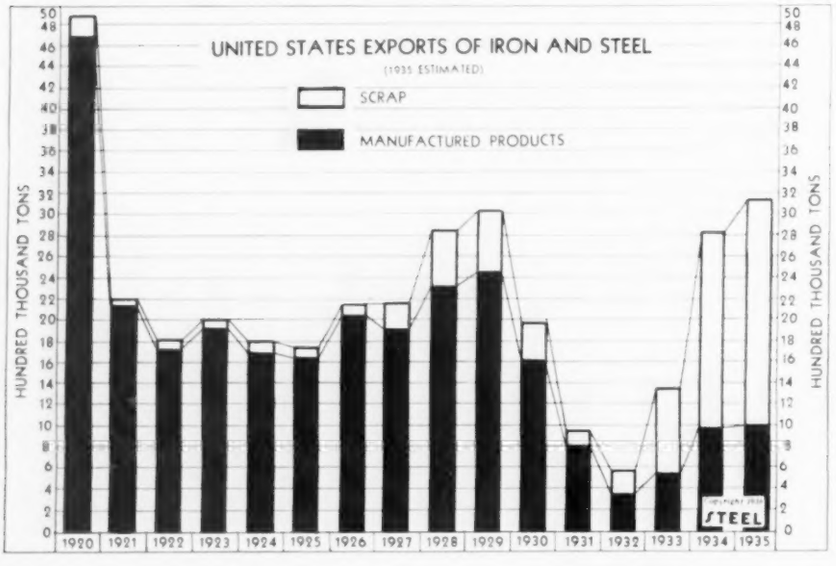
General conditions indicate a somewhat different alignment during the next year. Exports to Italy are likely to decline somewhat under war conditions, especially if sanctions and embargoes are effective. That country in 1933 took 118,731 gross tons of steel, in 1934 it took 231,059 tons and for ten months of 1935 it took 331,027 gross tons.

Japan's enterprise in northern China may have some effect in altering the flow of steel exports from the United States. China received from the United States 36,885 gross tons of steel in 1933, a total of 82,393 gross tons in 1934 and 49,945 tons in ten months of 1935.

This view seems plausible because Japan itself is a heavy importer from this country. In 1933 it took 593,207 gross tons, in 1934 1,249,192 tons and in ten months of 1935 it took 1,109,329 gross tons, largely scrap.

Recent tariff agreements with Canada seem likely to increase exports of steel products to that country, already a large customer of the United States. In 1933 Canada received 139,507 gross tons of steel and iron products, in 1934 it took 273,277 gross tons, and in ten months of 1935 it took 268,781 gross tons.

Every indication points to increasing volume of steel and iron exports in 1936 and succeeding years. The only important uncertainty is the war situation. In case no major development occurs in this respect, it is fair to assume that 1936 exports of manufactured steel products, excluding scrap, will pass the mark of 1,000,000 tons and probably climb well toward the average level of the years from 1921 to 1928, which was close to 2,000,000 tons annually.



THE BUSINESS TREND

	1935	1934
Jan.	91	78
Feb.	89	81
March	88	84
April	86	85
May	85	86
June	86	84
July	86	75
Aug.	87	73
Sept.	89	71
Oct.	94	73
Nov.	....	74
Dec.	....	86

	1933	1932
Jan.	65	72
Feb.	64	69
March	60	67
April	67	63
May	77	60
June	91	59
July	100	58
Aug.	91	60
Sept.	84	66
Oct.	77	67
Nov.	73	65
Dec.	75	66

Steadiness of 1935 Makes Good Springboard for 1936

FROM several important standpoints, the trend of business was more satisfactory in the past 12 months than in any year since the pre-depression period. Careful examination of general barometers of activity or volume shows conclusively that it is necessary to go back to 1928 to find a year that surpasses 1935 in accomplishment or promise.

The outstanding feature of the past year, and the one which differentiated it from everyone of its six predecessors, was stability. From 1929 to 1934 inclusive, every 12-month period was marked by at least one severe business recession. In sharp contrast to this, the curve of business in 1935, while exhibiting a mild tapering off in the two middle quarters, on the whole fluctuated within narrow limits.

The significance of the stability of 1935 is particularly noticeable when one compares the trend with that of the two preceding recovery years. In 1933 the startling gains in the second quarter were largely offset by a precipitous decline in the third and fourth quarters. In 1934, a marked improvement during most of the first half was more than washed out by an almost vertical recession in mid-year and a further mild decline in the subsequent five months. In 1935 the moderate losses sustained from April to September, inclusive, were more than made up in the gains of October and November. Moreover, the strong rise just before the end of the year carried many general indexes to levels that were higher than in the corresponding weeks of 1929.

From the charts presented in this section of STEEL, it is evident that the current promising state of business has been developed on a basis of unbalanced support from the important divisions of industry. Heightened activity in the so-called consumers good industries, such as automobile, electric refrigerator, container, etc., has enabled them to contribute more than their normal support. On the other hand, the capital goods industries, including building, heavy equipment, etc., still are depressed.

Significantly, the closing weeks of 1935 gave evidence of an accelerated tendency toward authorizing expenditures for capital goods. All signs point to more building activity in the near future. If the trend of business in 1935 was a fair criterion of recovery built upon the consumers' goods industries, what, then, can we expect in 1936 when support from capital goods will be stronger?

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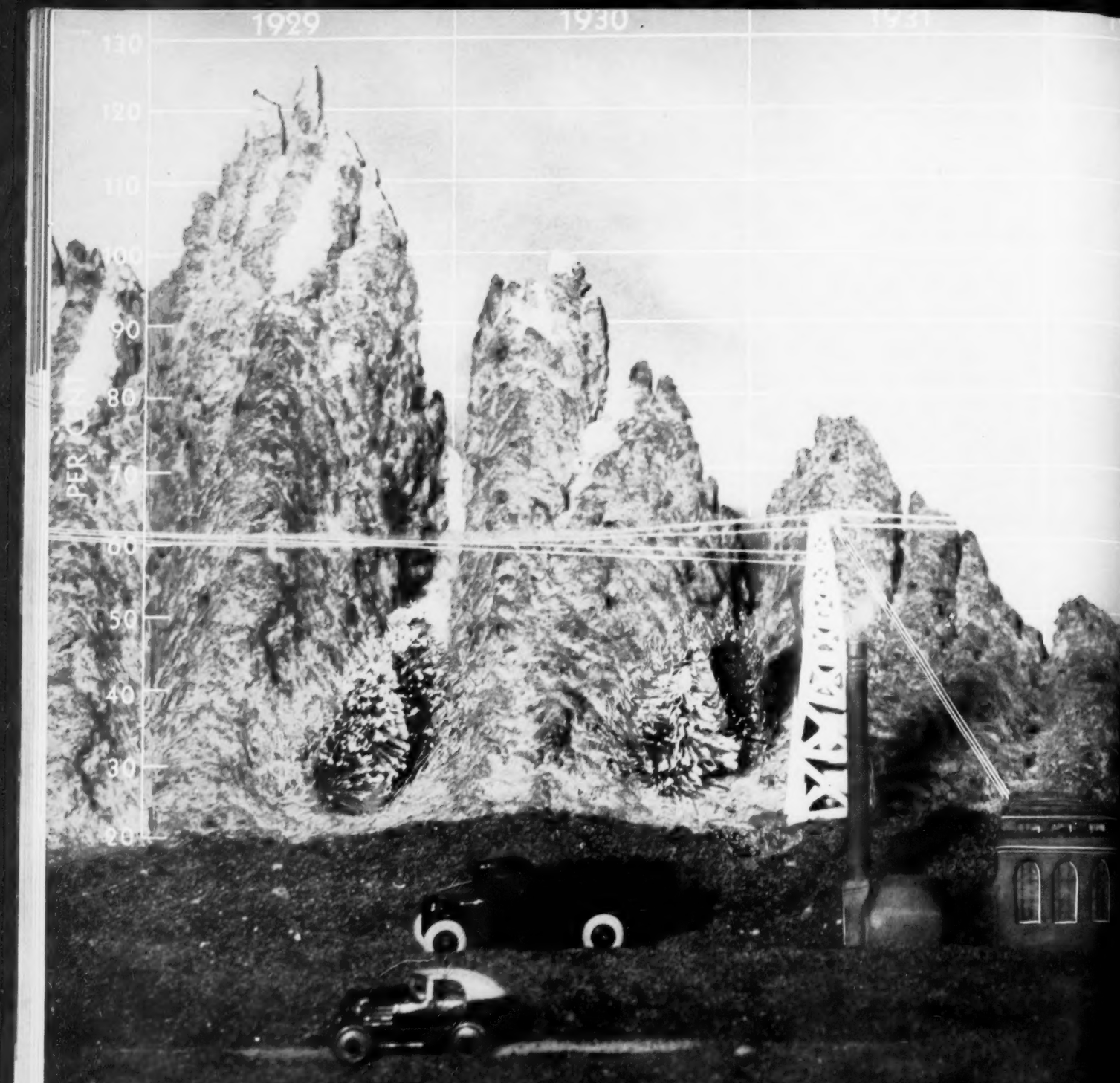
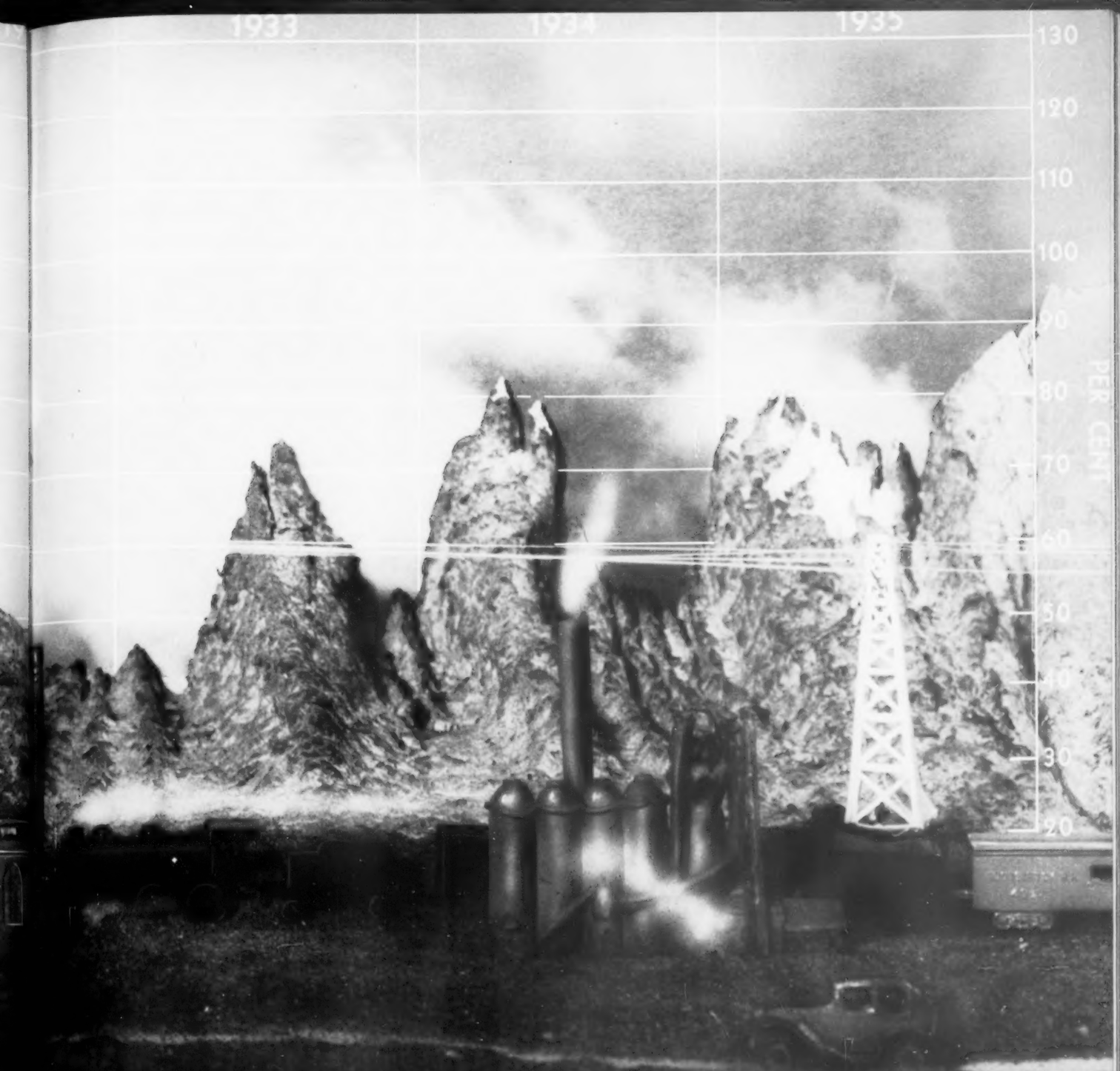


THROUGH the ingenious use of a papier-mache model, aided by modern photography, our artists have created a landscape whose clearly delineated skyline is an accurate reproduction of the curve of STEEL'S weekly index of activity in the iron, steel and metalworking industries.

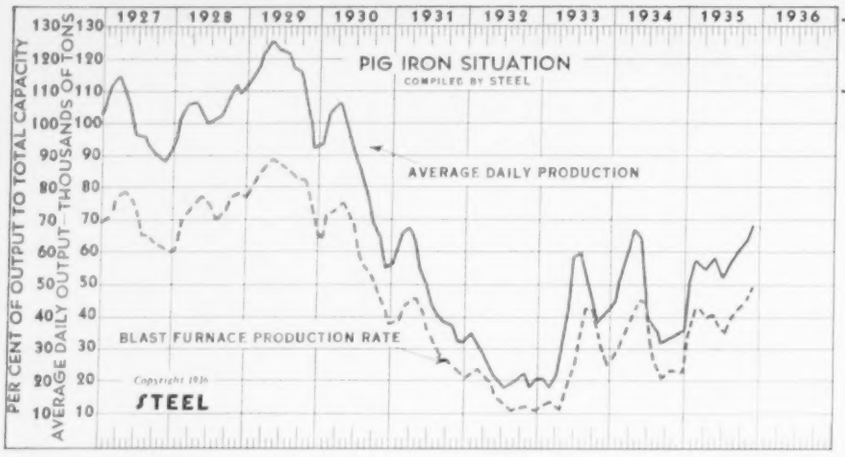
The 7-year panorama shows at a glance the path of activity spanning industry's most severe depression. In it is clearly depicted the heart-breaking series of declines from the peaks of 1929 to the tortuous bad lands of 1932. The dark valley of March, 1933, is easily discernible. The three ascents toward recovery in 1933 and 1934 and three attendant relapses stand out in bold relief. And finally, the rise to higher ground in the last half of 1935 shows up impressively in contrast to the fluctuating horizon of the previous four years. In the final weeks of 1935



activity was running appreciably ahead of that for the corresponding weeks of 1929.

The dawn of 1936 finds industrial activity at a height exceeded during the seven years only by the peaks of the spring of 1930 and of the first 10 months of 1929.

The modeled figures in the foreground are symbolic of the factors which form the basis for STEEL'S index. These are (1) the weekly rate of steelworks operations, (2) the weekly rate of automobiles assembled, (3) weekly railroad freight car loadings and (4) weekly electric power output. With the steel rate weighted at 40 and the other factors at 20 each, the average for all four is given a value of 100 for the year 1926. Thus the current index always represents the percentage of current activity in relation to a par of 100 in 1926.


PIG IRON SITUATION
COMPILED BY STEEL
AVERAGE DAILY PRODUCTION
BLAST FURNACE PRODUCTION RATE
PER CENT OF OUTPUT TO TOTAL CAPACITY
AVERAGE DAILY OUTPUT—THOUSANDS OF TONS
1927 1928 1929 1930 1931 1932 1933 1934 1935 1936
Copyright 1936
STEEL

Blast Furnace Output and Rate

	Daily Average, Tons,			Blast Furnace Rate, Per Cent		
	1935	1934	1933	1935	1934	1933
Jan.	47,692	39,537	18,348	34.2	28.3	13.3
Feb.	57,675	45,385	19,752	41.4	32.5	14.3
Mar.	57,120	52,438	17,484	41.0	37.5	12.7
April	55,719	57,873	20,786	40.0	41.4	15.1
May	55,986	66,370	28,784	40.2	47.5	20.9
June	51,949	64,563	42,165	37.2	46.3	30.6
July	49,043	39,630	58,108	35.2	28.4	42.4
Aug.	56,767	34,199	59,137	40.7	24.5	42.8
Sept.	59,009	29,969	50,264	42.5	21.5	36.4
Oct.	63,818	30,689	43,824	45.8	22.1	31.8
Nov.	68,876	31,030	36,124	49.5	28.3	26.2
Dec.	.....	33,161	38,456	.....	23.7	27.9

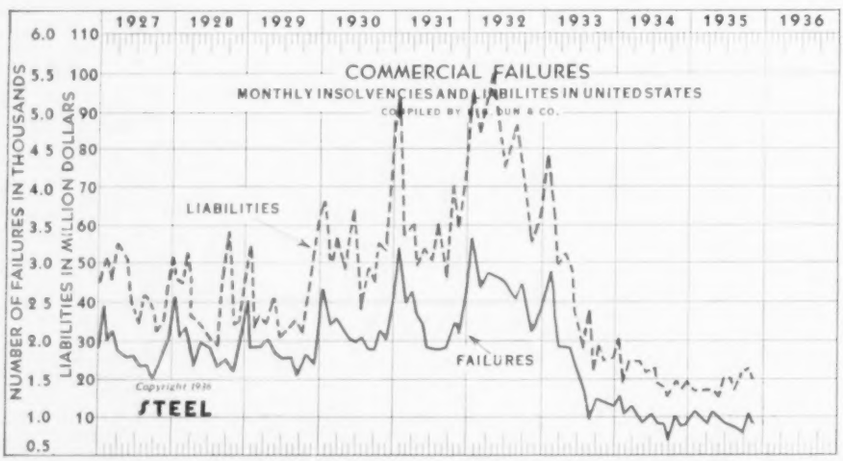
BUILDING CONSTRUCTION
CONTRACT AWARDS IN 37 STATES
COMPILED BY F. W. DODGE CORP.
MILLIONS OF SQUARE FEET
1927 1928 1929 1930 1931 1932 1933 1934 1935 1936
Copyright 1936
STEEL

Contract Awards in 37 States

	Square Feet		
	1935	1934	1933
January	11,245,100	9,568,700	8,453,000
February	9,670,300	8,176,300	7,382,400
March	15,873,100	14,788,900	9,890,000
April	19,981,100	14,207,100	10,870,000
May	22,276,200	14,664,400	15,277,000
June	22,878,800	13,986,500	16,199,500
July	21,565,900	13,250,000	14,605,600
August	21,545,400	14,259,000	12,942,000
September	21,365,700	12,510,300	13,365,400
October	27,775,900	15,098,100	15,534,700
November	24,120,700	12,780,800	11,762,300
December	.....	9,193,300	11,451,500

Index of Commodity Prices

	1935	1934	1933
January 1	$9.49	$9.01	$6.53
February 1	9.78	9.26	6.35
March 1	9.79	9.17	6.54
April 1	9.66	9.16	6.98
May 1	9.79	9.14	8.02
June 1	9.90	9.24	8.34
July 1	9.84	9.32	9.01
August 1	9.91	9.48	8.99
September 1	10.00	9.45	9.05
October 1	10.17	9.27	8.84
November 1	10.28	9.29	8.81
December 1	.....	9.49	8.83

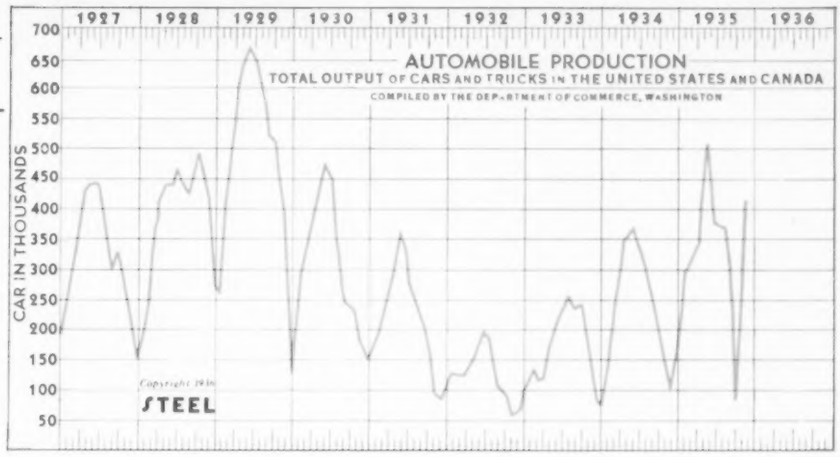

COMMERCIAL FAILURES
MONTHLY INSOLVENCIES AND LIABILITIES IN UNITED STATES
COMPILED BY R. G. DUN & CO.
LIABILITIES
FAILURES
NUMBER OF FAILURES IN THOUSANDS
LIABILITIES IN MILLION DOLLARS
1927 1928 1929 1930 1931 1932 1933 1934 1935 1936
Copyright 1936
STEEL

Failures and Liabilities in U.S.

	Failures, Number			Liabilities in Dollars (000 omitted)		
	1935	1934	1933	1935	1934	1933
Jan.	1,184	1,364	2,919	$18,823	$32,905	$79,100
Feb.	1,005	1,049	2,378	18,737	19,444	65,576
Mar.	976	1,102	1,948	18,522	25,786	48,500
Apr.	1,115	1,052	1,921	18,063	25,786	51,097
May	1,027	977	1,909	15,669	22,560	47,971
June	961	1,033	1,648	20,463	23,868	35,344
July	931	912	1,421	20,446	19,325	27,481
Aug.	910	929	1,472	17,845	18,459	42,776
Sept.	806	790	1,116	21,837	16,440	21,846
Oct.	1,097	1,091	1,206	22,243	19,968	30,581
Nov.	9,271	923	1,237	20,023	18,349	25,353
Dec.	.....	963	1,132	.....	19,910	27,200

Auto Output U. S. and Canada

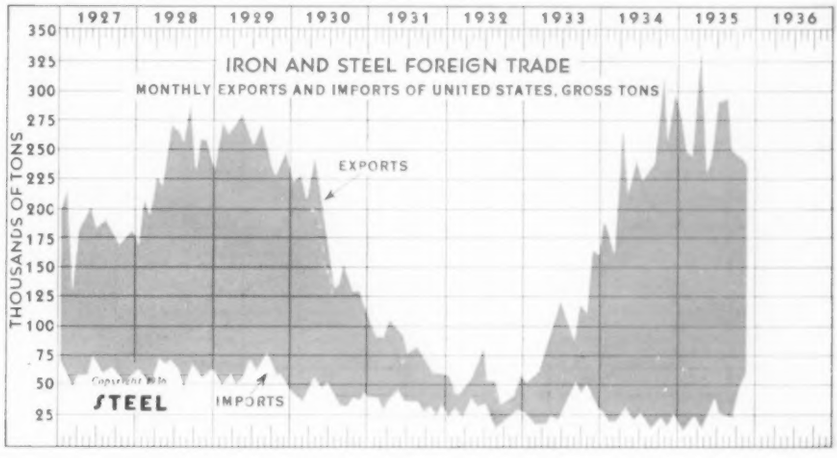
	1935	1934
January	303,372	162,570
February	358,658	238,827
March	451,809	352,614
April	501,837	371,338
May	385,486	350,616
June	377,065	320,382
July	350,118	276,047
August	247,743	244,715
September	95,128	175,586
October	283,334	135,771
November	411,520	85,179
December	.....	156,358


1927 1928 1929 1930 1931 1932 1933 1934 1935 1936
AUTOMOBILE PRODUCTION
TOTAL OUTPUT OF CARS AND TRUCKS IN THE UNITED STATES AND CANADA
COMPILED BY THE DEPARTMENT OF COMMERCE, WASHINGTON
CAR IN THOUSANDS
700 650 600 550 500 450 400 350 300 250 200 150 100 50
Copyright 1936
STEEL

Iron and Steel Foreign Trade

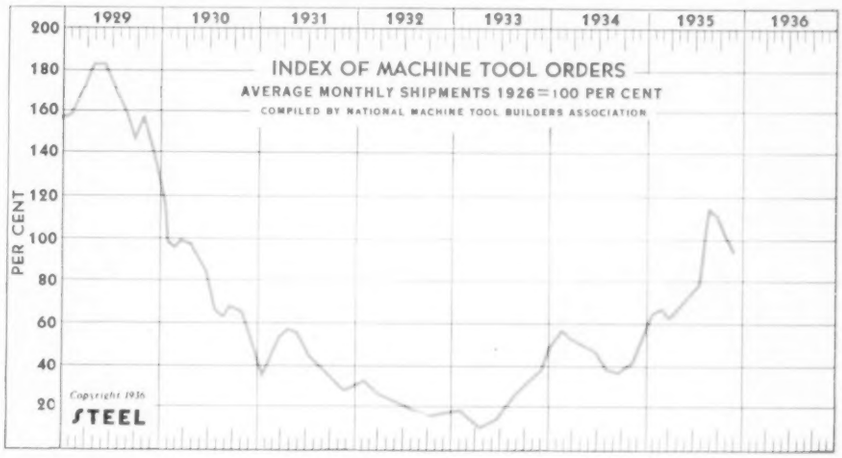
Gross Tons

	1935		1934	
	Imports	Exports	Imports	Exports
Jan.	22,784	262,740	22,653	178,023
Feb.	28,905	228,537	25,407	151,184
Mar.	21,409	323,035	38,393	261,260
April	28,866	205,336	26,862	201,539
May	47,719	286,598	29,465	241,753
June	33,208	289,687	24,848	219,406
July	31,894	296,802	17,676	233,186
Aug.	31,312	247,312	32,418	242,947
Sept.	53,158	244,419	23,847	301,330
Oct.	59,569	238,358	22,202	220,209
Nov.	.....	.....	35,272	299,263
Dec.	.....	.....	19,708	282,655


1927 1928 1929 1930 1931 1932 1933 1934 1935 1936
IRON AND STEEL FOREIGN TRADE
MONTHLY EXPORTS AND IMPORTS OF UNITED STATES, GROUSS TONS
THOUSANDS OF TONS
350 325 300 275 250 225 200 175 150 125 100 75 50 25
EXPORTS
IMPORTS
Copyright 1936
STEEL

Index of Machine Tool Orders

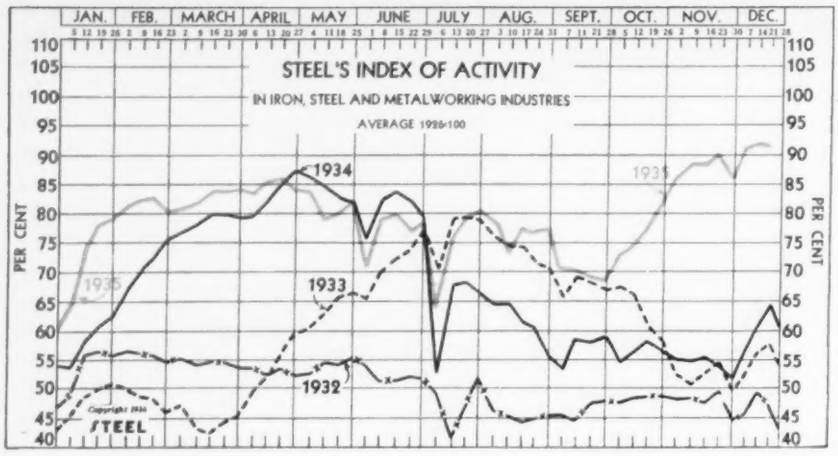
	1935	1934	1933	1932
Jan.	61.3	56.5	18.3	32.8
Feb.	61.5	58.2	15.2	30.4
March	60.3	50.9	11.1	23.9
April	60.3	48.5	8.3	20.6
May	67.1	46.8	10.6	20.8
June	76.7	42.6	15.5	21.7
July	94.7	38.6	22.4	18.7
Aug.	112.2	37.1	27.9	16.8
Sept.	108.5	37.4	30.9	15.3
Oct.	102.9	40.5	33.3	15.7
Nov.	93.8	44.2	38.0	16.4
Dec.	.....	54.1	51.0	17.6

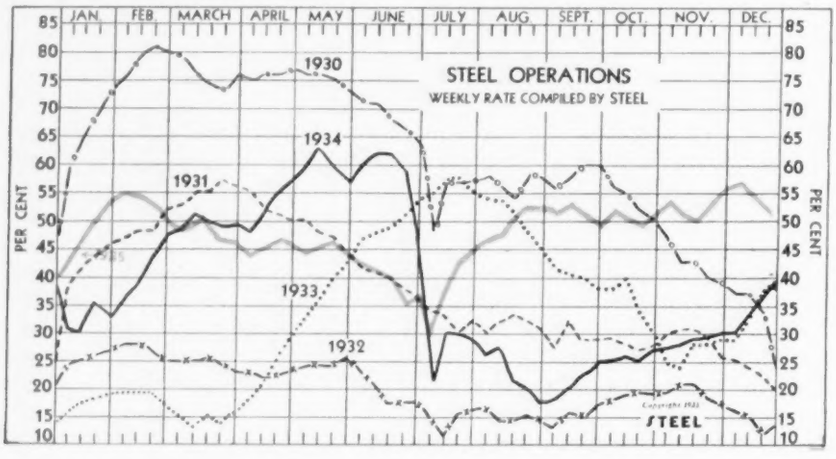

1929 1930 1931 1932 1933 1934 1935 1936
INDEX OF MACHINE TOOL ORDERS
AVERAGE MONTHLY SHIPMENTS 1926=100 PER CENT
COMPILED BY NATIONAL MACHINE TOOL BUILDERS ASSOCIATION
PER CENT
200 180 160 140 120 100 80 60 40 20
Copyright 1936
STEEL

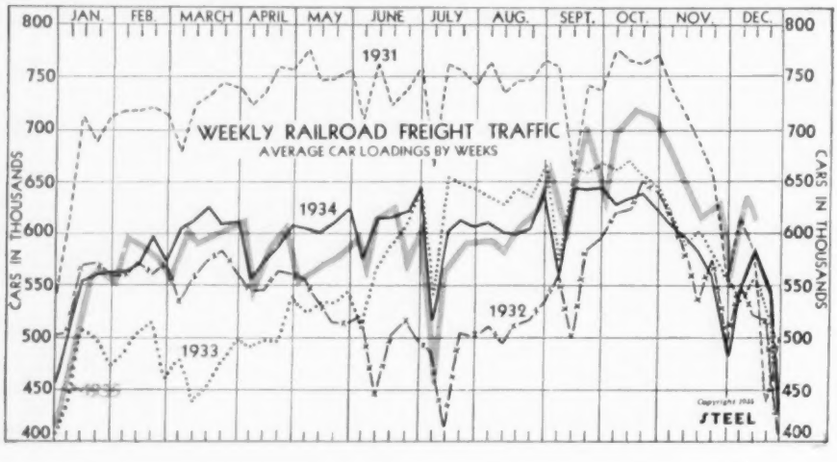
Steel Shipments, U.S. Steel Corp.

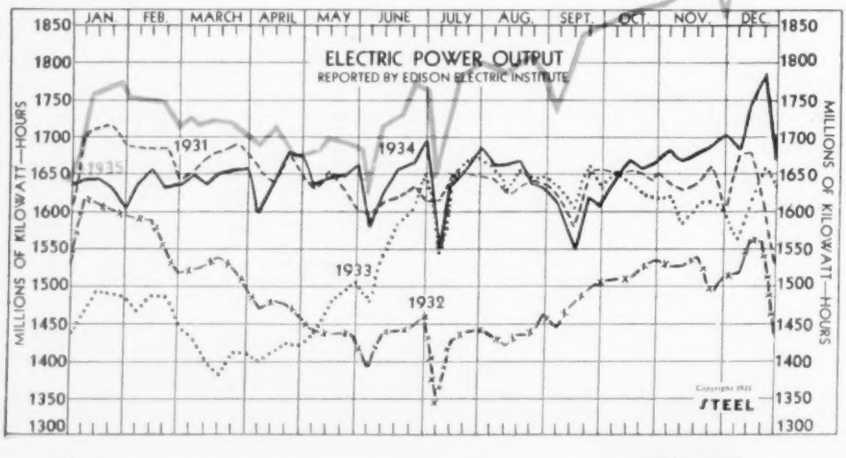
Gross Tons

	1935	1934	1933
Jan.	534,055	331,777	285,138
Feb.	583,137	385,500	275,929
March	668,056	588,209	256,793
April	591,728	643,009	335,321
May	598,915	745,063	455,302
June	578,108	985,337	603,937
July	547,794	369,938	701,322
Aug.	624,497	378,023	668,155
Sept.	614,933	370,306	575,161
Oct.	686,741	343,962	572,897
Nov.	681,820	366,119	430,358
Dec.	.....	418,630	600,639





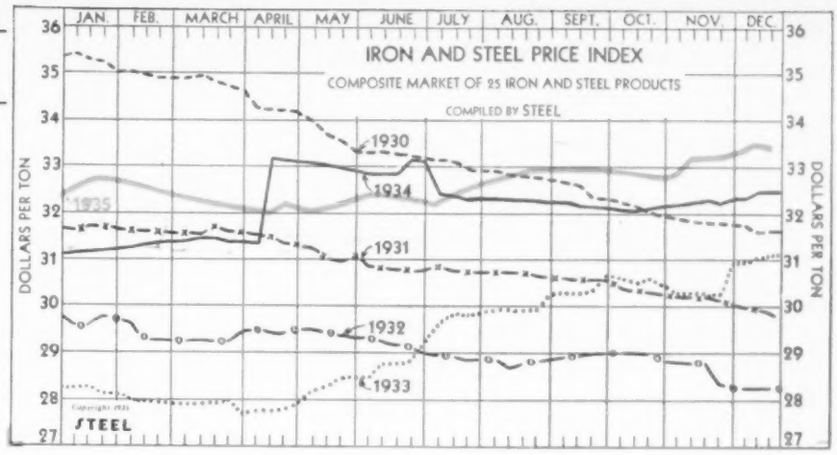




THE BUSINESS TREND

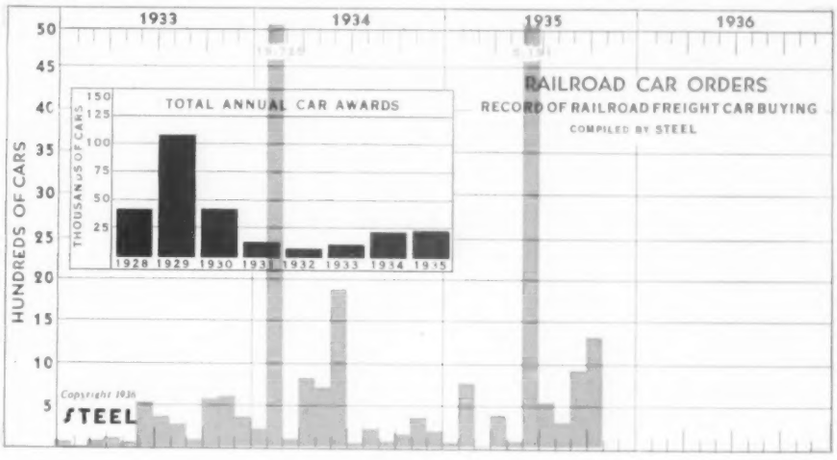
For week ended	STEEL'S Index of Activity (Per Cent)	Steelworks Operating Rate (Per Cent)	Freight Car Loadings (Cars)	Electric Power Output (Million Kw.-Hrs.)
Jan. 5	65.4	42.5	498,073	1,669
Jan. 12	73.8	45.5	553,675	1,773
Jan. 19	78.1	51	562,955	1,778
Jan. 26	79.5	53	555,768	1,782
Feb. 2	81.8	54.5	598,164	1,763
Feb. 9	82.7	54.5	592,560	1,764
Feb. 16	82.8	53	581,981	1,761
Feb. 23	80.5	50	552,896	1,728
March 2	81.1	48	604,642	1,734
March 9	82.0	50	587,270	1,724
March 16	84.0	48	597,432	1,729
March 23	84.0	46	607,780	1,725
March 30	84.3	45	617,485	1,713
April 6	83.4	44	545,627	1,700
April 13	85.4	45	587,685	1,725
April 20	86.3	46	610,905	1,703
April 27	84.9	46	558,886	1,673
May 4	84.6	44	569,065	1,698
May 11	79.3	44.5	575,185	1,702
May 18	80.5	45.5	583,327	1,700
May 25	82.8	44	599,513	1,696
June 1	71.9	42.5	565,342	1,629
June 8	79.3	41	630,836	1,724
June 15	80.0	39	653,092	1,743
June 22	77.3	35.5	567,847	1,775
June 29	78.4	37	618,036	1,772
July 6	64.1	31	472,121	1,655
July 13	76.5	38	566,488	1,766
July 20	79.8	43	593,366	1,807
July 27	80.8	45	596,462	1,824
Aug. 3	78.4	47	597,083	1,821
Aug. 10	73.4	48	583,743	1,819
Aug. 17	77.5	51	615,006	1,833
Aug. 24	77.0	52.5	626,373	1,840
Aug. 31	77.3	52.5	679,861	1,810
Sept. 7	70.9	52	582,786	1,752
Sept. 14	70.1	54	700,357	1,828
Sept. 21	69.4	52	707,644	1,852
Sept. 28	68.5	51	630,771	1,857
Oct. 5	73.3	53.5	706,877	1,863
Oct. 12	74.9	52	734,274	1,867
Oct. 19	77.4	51	732,947	1,863
Oct. 26	82.4	52.5	707,826	1,896
Nov. 2	86.4	54.5	680,662	1,897
Nov. 9	88.4	53	653,525	1,914
Nov. 16	88.8	52	628,330	1,939
Nov. 23	90.9	54.5	646,503	1,953
Nov. 30	86.0	56	570,427	1,876
Dec. 7	91.7	57	637,133	1,969
Dec. 14	91.8	54.5	615,237	1,983
Dec. 21	91.9	52	599,534	2,002
Dec. 28	....	48	.....	.....

Statistics showing STEEL'S composite average of 25 iron and steel prices will be found on page 273 of this issue.



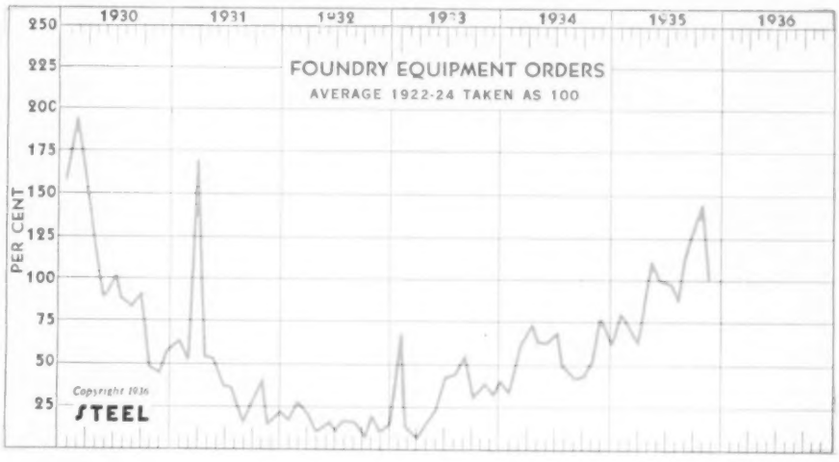
Railroad Freight Car Awards

	1935	1934	1933	1932
Jan.	24	152	3	159
Feb.	806	19,725	0	35
March	0	30	5	105
April	350	800	50	0
May	2	717	8	60
June	5,151	1,835	500	0
July	500	19	306	25
Aug.	200	105	202	5
Sept.	875	7	23	1,298
Oct.	1,250	75	514	0
Nov.	100	254	533	2
Dec.	.....	110	316	50



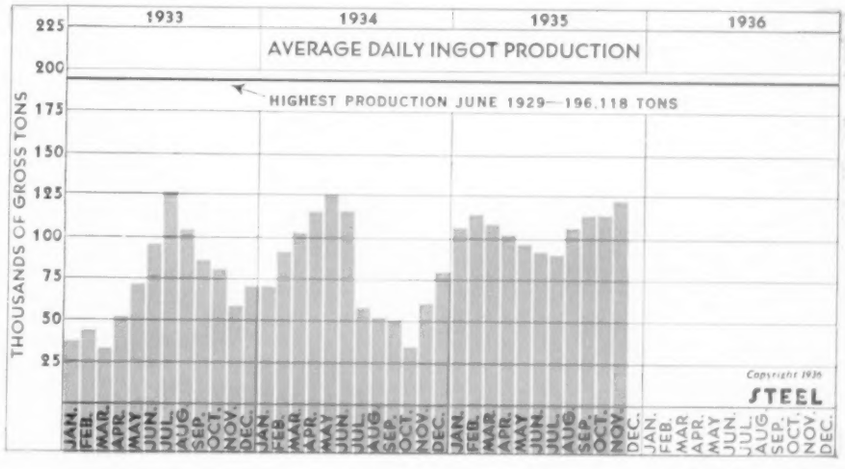
Foundry Equipment Orders

	Per Cent		
	1935	1934	1933
Jan.	86.6	37.2	68.4
Feb.	75.7	65.8	16.1
March	69.3	75.4	9.8
April	113.2	67.9	19.4
May	100.7	66.5	25.6
June	100.2	70.4	45.5
July	94.0	50.7	48.8
Aug.	113.0	43.1	56.3
Sept.	128.5	46.4	34.9
Oct.	140.0	55.3	42.5
Nov.	100.4	80.4	36.6
Dec.	.....	66.9	43.8



Average Daily Ingot Output

	Gross Tons		
	1935	1934	1933
Jan.	106,353	73,968	39,110
Feb.	115,740	92,164	44,709
March	110,313	103,646	33,268
April	101,558	117,443	53,817
May	97,624	125,907	73,201
June	89,236	117,672	98,632
July	87,316	59,578	126,734
Aug.	108,123	51,161	106,058
Sept.	113,193	50,759	87,811
Oct.	116,545	54,885	80,188
Nov.	121,279	61,947	58,507
Dec.	.....	78,570	71,944



Consumption Ratios of Main Groups in Percentages

	1935	1934	1933	1932	1931	1930	1929	1928	1927	1926	1925	1924	1923	1922
Automotive	24.04	20.87	20.95	18.15	14.78	14.10	17.57	17.76	13.34	15.09	14.60	11.37	10.59	8.98
Buildings	13.01	12.70	12.18	16.38	16.80	17.80	14.70	15.22	14.89	13.10	15.26	14.44	13.53	11.84
Containers	9.30	8.68	12.25	10.79	7.90	5.77	4.67	4.56	5.21	5.24	4.20	4.96	3.68	4.16
Railroads	7.75	12.96	8.04	9.09	14.65	16.95	18.44	17.02	20.37	22.81	22.26	27.54	31.02	24.96
Agriculture	4.74	2.42	3.01	2.76	3.56	4.51	5.27	6.34	4.42	2.70	3.02	3.54	2.34	2.47
Machinery	4.37	3.65	3.63	3.39	3.37	3.80	3.81	3.48	2.79	2.65	2.69	3.69	2.63	2.83
Oil, gas, water	4.29	4.97	4.88	5.50	9.75	9.48	9.01	7.72	8.90	9.29	8.03	8.43	10.60	14.84
Exports	3.85	5.29	3.61	3.31	4.10	4.34	4.83	5.52	5.39	5.29	4.47	5.89	6.22	7.82
Jobbers	14.43	14.02	14.91	16.12	12.68	12.21	11.05	10.78	12.82	10.52	.....	.....	.....	.....
All other	14.22	14.44	16.54	14.51	12.41	11.04	10.65	11.60	11.87	13.31	25.47	20.14	19.39	22.10

Autos Gain as Leading Steel Consumer; Buildings Second

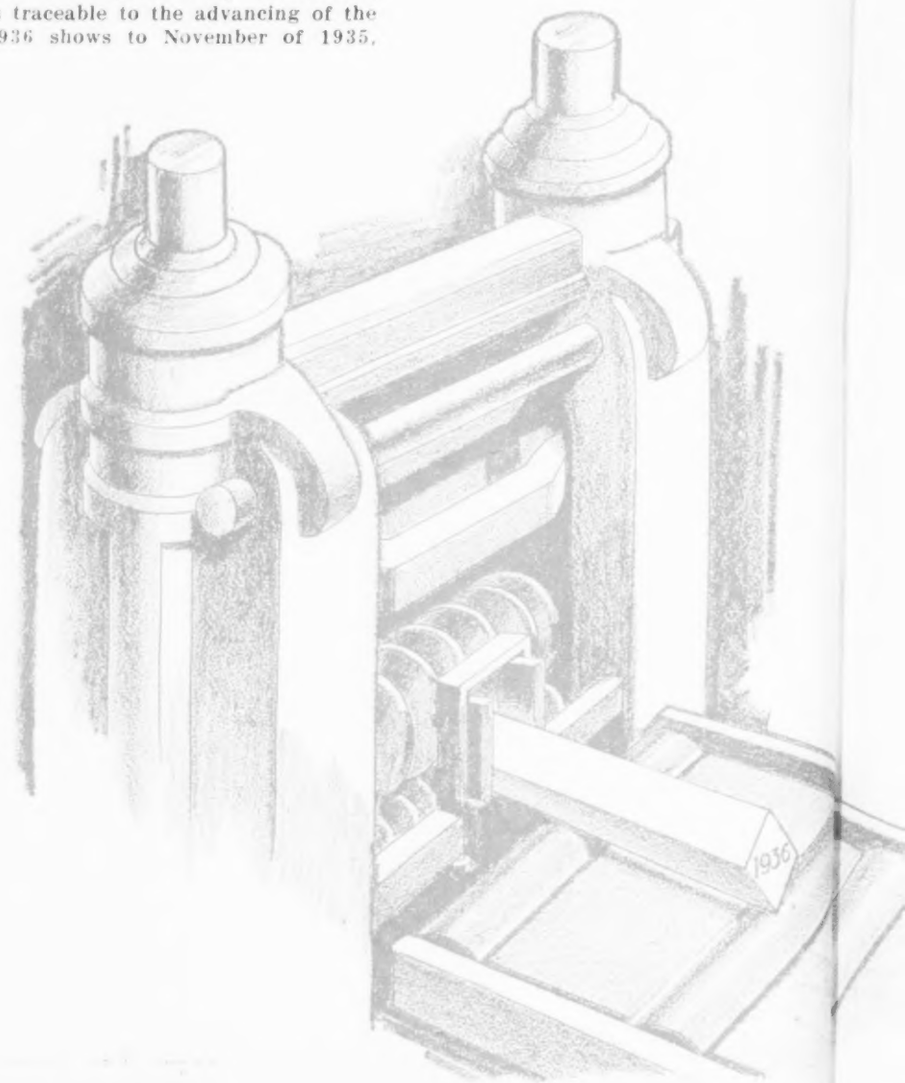
EMPHASIZING the unbalanced character of recovery, STEEL'S annual figures on the distribution of finished rolled steel show that in 1935 consumption increased encouragingly in the "consumers' goods" fields and gained moderately or even lost ground in the industries which depend upon capital expenditures.

Automobiles, now generally conceded to belong to the "consumers' goods" classification, increased their lead from 20.87 per cent in 1934 to 24.04 per cent of the total finished steel consumed in 1935. This is the highest percentage accorded any consuming classification since 1924, when the railroads took 27.54 per cent of the output. The remarkable showing made by automobiles is traceable to the advancing of the 1936 shows to November of 1935, which had the effect of allocating parts of two seasons in the single year.

Marked shifts occurred among all of the remaining consuming groups. Buildings, which in 1934 took 12.70 per cent of the tonnage, in 1935 took 13.01 per cent. While on the surface this may appear to be a gain for the capital goods group, such is not the case. The percentage of the consumption of steel for erection materials, frame-

How Steel Ingots Shrink

		Gross tons
Steel ingot production, 1934 (11 months actual, December estimated)		33,901,000
Ingots to forgings direct		370,000
		33,531,000
Loss in conversion, ingots to semifinished (20 per cent)		6,706,200
Semifinished steel production		26,824,800
Loss in conversion, semifinished to finished steel (10 per cent)		2,682,480
Total finished rolled steel		24,142,320
Distribution:	% of total	
Automotive	24.04	5,803,814
Buildings	13.01	3,140,916
Containers	9.30	2,245,236
Railroads	7.75	1,871,030
Agriculture	4.74	1,144,346
Machinery	4.37	1,055,019
Oil, gas, water	4.29	1,035,705
Exports	3.85	929,479
All other	28.65	6,916,775
Totals	100.00	24,142,320



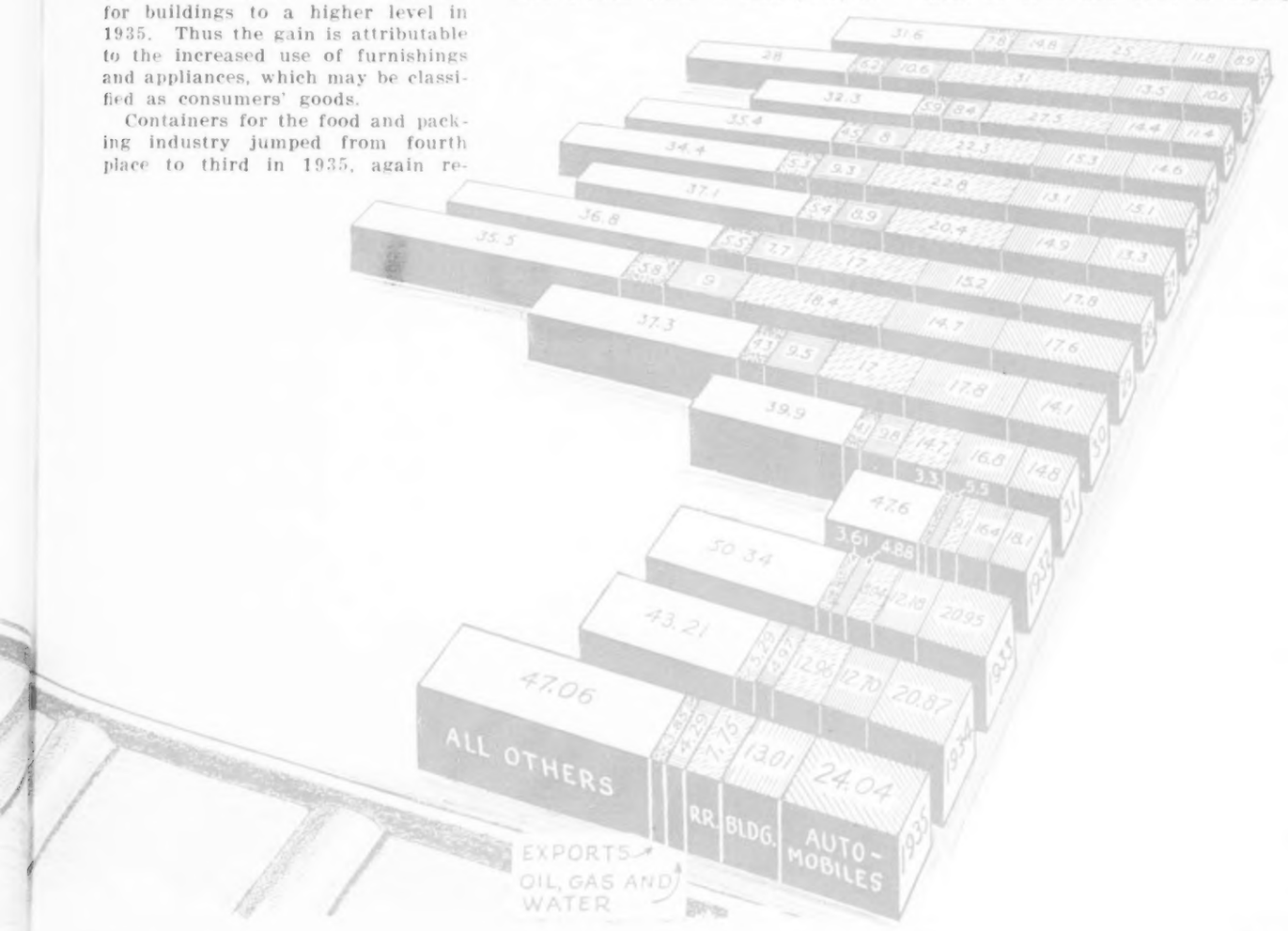
Distribution of Steel in Per Cent to Consuming Groups

	Rails, heavy and light	Angle bars, steel ties and other track accessories	Plates	Structural shapes over 3 inch	Bars, except concrete bars, and shapes under 3 inch	Concrete bars	Black plate for tinning	All other black plate and sheets except galv. sheets	Galvanized sheets	Strip steel	Tubing and pipe	Wire products
1—Railroads												
a Cars and locomotives	....	1.41	11.30	5.11	4.59	....	0.05	1.32	1.20	0.94	1.30	1.03
b Track construction and repair	86.04	87.66	0.39	0.01	0.48	....	....	0.01	....	0.04	0.45	0.67
c Buildings and bridges	0.10	0.17	1.50	3.48	0.47	0.73	....	0.05	0.59	0.03	0.14	0.32
2—Buildings												
a Erection materials, framework, trim, etc.	0.19	0.07	14.45	53.38	5.08	44.06	0.18	1.86	4.81	1.57	0.76	5.07
b Furnishings, furniture, stoves, refrigerators, etc.	....	....	4.18	0.24	2.10	0.02	0.90	11.09	7.42	4.39	0.39	5.57
c Other miscellaneous products for buildings	....	0.01	2.18	....	0.31	0.28	0.30	2.51	6.10	1.05	4.17	0.52
3—Highways and highway bridges	....	....	0.73	2.57	0.49	23.78	....	0.30	7.24	0.09	0.21	2.47
4—Automotive	0.02	0.02	5.37	1.35	40.14	0.05	0.28	42.49	0.57	57.06	1.69	8.75
5—Oil, gas and water	....	0.02	8.74	1.70	0.44	0.75	1.42	2.37	0.28	0.14	37.59	0.35
6—Mining, quarrying, lumbering	6.08	4.33	1.07	0.57	0.27	0.03	....	0.14	0.39	0.24	0.14	0.43
7—Agricultural												
a Implements	0.03	0.02	3.02	2.26	11.65	0.02	0.03	1.90	2.13	4.19	0.37	1.35
b Other agricultural uses	....	....	0.04	0.08	0.02	0.33	0.01	0.83	2.28	0.43	0.19	10.61
8—Shipbuilding and repair	0.01	0.02	6.66	2.24	0.55	0.02	....	0.13	0.14	0.04	0.54	0.10
9—Machinery, tools, equipment (including electrical)	0.13	0.07	8.71	4.72	8.11	3.04	0.07	5.79	1.15	3.98	2.51	2.07
10—Food and packing industry (all containers)	....	....	0.48	0.06	0.13	....	82.22	6.54	2.25	3.22	0.07	1.25
11—Exports	5.02	1.75	5.09	3.92	1.50	3.36	9.35	2.49	8.49	1.67	3.75	5.30
12—Miscellaneous	1.77	1.28	18.36	5.48	14.58	2.13	3.38	10.37	6.07	17.31	6.06	17.01
Jobbers	0.61	3.17	7.73	12.83	9.09	21.40	1.81	9.81	48.89	3.58	39.67	37.13
Grand totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

work, trim, etc., actually declined. However, the percentage for steel for furnishings, furniture, stoves, refrigerators, etc., increased sufficiently to bring the total percentage for buildings to a higher level in 1935. Thus the gain is attributable to the increased use of furnishings and appliances, which may be classified as consumers' goods.

Containers for the food and packing industry jumped from fourth place to third in 1935, again reflecting the activity in consumers' goods.

Railroads which took 12.96 per cent of the tonnage in 1934 and held second place in that year, in 1935 took only 7.75 per cent, which forced them into fourth place. The loss probably is not a natural one. The action of the federal government in 1933 and 1934 in urging



the roads to buy rails and track material in 1934 undoubtedly bolstered consumption in that year to the detriment of consumption in 1935.

Three contesting consumer groups battled closely for fifth position. It goes to agriculture with a percentage of 4.74. Machinery is sixth and oil, gas and water seventh, with percentages of 4.37 and 4.29, respectively.

Consumers in the capital goods group which remained practically stationary or lagged behind 1934 showings were highways and bridges; mining, quarrying and lumbering; and shipbuilding and repair. Of the heavy industries, machinery made the best record.

The distribution figures for 1935, which are the fourteenth in the annual series which was inaugurated in 1921 by *Iron Trade Review* (predecessor of STEEL), are compiled from reports received from 89 operating companies. Of these, 51 have steel ingot capacity amounting to 96.28 per cent of the total reported for the United States by the American Iron and Steel institute. The remaining 38 companies from which reports were received, do not operate steelworks but roll or finish steel purchased from steelmakers.

Interpreting the Figures

The table on page 208 shows the actual tonnages reported, and the table on page 207 shows percentages calculated from the actual tonnage. In the table headed "How Steel Ingots Shrink", the estimated steel ingot production for 1935 is broken down to arrive at an approximate figure for finished steel output. This figure is 24,142,320 gross tons. The percentages in the last column of the table on page 208 have been applied to this figure to give the calculated total tonnage for automobiles, buildings, etc. appearing at the bottom of the table "How Steel Ingots Shrink."

Readers undoubtedly will not be confused if they remember that the tonnages shown on page 208 are "reported tonnages" (which fall short of the actual total for the country due to the impossibility of receiving reports from every company) and that the tonnage distribution shown under "How Steel Ingots Shrink" represents calculated totals.

Distribution of Steel in Gross Tons to Consuming Groups

Based on 1935 Returns from 89 Operating Companies

	Rails, heavy and light	Angle bars, steel ties and other track accessories	Plates	Structural shapes over 3 inch	Bars, except concrete bars, and shapes under 3 inch	Concrete bars	Black plate for tinning	All other black plate and sheets except galv. sheets
1—Railroads								
a Cars and locomotives	7	4,572	156,168	61,922	155,211	.....	1,000	48,932
b Track construction and repair	610,966	285,176	5,401	136	16,089	11	.....	128
c Buildings and bridges	677	565	23,662	42,146	15,778	3,292	.....	1,781
2—Buildings								
a Erection materials, framework, trim, etc.	1,354	225	199,698	646,503	171,711	199,090	3,427	63,943
b Furnishings, furniture, stoves, refrigerators, etc.	.....	1	57,793	2,947	71,196	74	16,842	411,247
c Other miscellaneous products for buildings	.....	26	30,058	.....	10,636	1,288	5,625	93,197
3—Highways and highway bridges	.....	2	13,057	31,109	16,449	197,428	.....	11,248
4—Automotive	121	78	74,251	16,335	1,357,443	205	5,276	1,575,871
5—Oil, gas and water	11	70	123,710	20,559	14,855	3,386	26,414	87,909
6—Mining, quarrying, lumbering	43,112	14,105	14,746	6,881	9,035	154	6	5,021
7—Agricultural								
a Implements	214	52	41,764	27,425	394,121	75	528	70,377
b Other agricultural uses	.....	.....	552	951	721	1,500	200	33,863
8—Shipbuilding and repair	94	49	92,027	27,133	18,465	80	3	4,722
9—Machinery, tools, equipment (including electrical)	935	217	120,434	57,122	274,356	13,747	1,304	214,735
10—Food and packing industry (all containers)	.....	.....	6,629	762	4,547	.....	1,534,753	242,535
11—Exports	35,572	5,709	70,322	47,412	50,922	15,186	174,453	92,252
12—Miscellaneous	12,551	4,176	253,756	66,412	492,966	9,610	63,007	384,572
Totals	704,684	315,023	1,275,025	1,055,755	3,074,471	355,127	1,832,838	3,344,333
Jobbers	4,362	10,300	106,843	155,329	307,510	96,714	33,846	363,854
Grand totals	709,046	325,323	1,381,868	1,211,084	3,381,981	451,841	1,866,684	3,708,187

	Galvanized sheets	Strip steel	Tubing and pipe	Wire products	All other finished steel products	Grand totals	Per cent of total
1—Railroads							
a Cars and locomotives	11,301	29,384	20,440	19,047	57,688	565,642	2.72
b Track construction and repair	.....	1,396	7,069	12,389	9,263	947,124	4.55
c Buildings and bridges	5,550	1,027	2,221	5,922	428	100,049	0.48
2—Buildings							
a Erection materials, framework, trim, etc.	45,327	48,987	12,016	93,763	28,100	1,519,144	7.30
b Furnishings, furniture, stoves, refrigerators, etc.	70,025	136,614	6,180	103,051	6,359	882,326	4.24
c Other miscellaneous products for buildings	57,529	32,532	65,735	9,582	547	306,755	1.47
3—Highways and highway bridges	68,325	2,817	3,322	45,712	278	296,747	1.43
4—Automotive	5,338	1,776,190	26,747	161,870	6,058	5,005,784	24.04
5—Oil, gas and water	2,627	4,268	593,065	6,457	12,145	892,476	4.29
6—Mining, quarrying, lumbering	3,642	7,618	2,229	8,038	17,969	132,526	0.64
7—Agricultural							
a Implements	20,100	130,404	5,886	24,964	2,594	718,504	3.45
b Other agricultural uses	21,519	13,506	3,000	196,311	500	269,623	1.29
8—Shipbuilding and repair	1,303	1,359	8,488	1,910	1,257	156,890	0.75
9—Machinery, tools, equipment (including electrical)	10,809	123,877	39,530	38,416	14,522	909,974	4.37
10—Food and packing industry (all containers)	21,257	100,377	1,055	23,112	249	1,935,276	9.30
11—Exports	80,132	51,969	59,136	98,144	20,649	801,888	3.85
12—Miscellaneous	57,281	538,989	95,663	314,718	80,152	2,373,853	11.40
Totals	482,065	3,001,314	951,782	1,163,406	258,758	17,814,581	85.57
Jobbers	461,142	111,434	625,805	687,215	40,775	3,005,129	14.43
Grand totals	943,207	3,112,748	1,577,587	1,850,621	299,533	20,819,710	100.00

Distribution by Percentage of Alloy Steel in 1935

Shown by Consuming Groups and Individual Products

Group	Hot rolled bars	Cold drawn bars	Sheets	Plates	Pipe and tubes	Wire	Structural shapes	Hot rolled strip	Cold rolled strip	Tool steel	Forgings
1. Automotive	76.66	59.44	10.20	2.49	0.33	4.81	0.24	87.65	22.29	1.24	9.02
2. Machine tool	4.44	7.27	0.64	14.80	1.10	0.97	25.71	0.54	2.23	16.63	33.24
3. Railroad	1.02	5.74	35.22	17.84	0.06	0.03	29.96	3.52	1.99	1.73	22.98
4. Agricultural	3.02	5.14	1.79	0.87	0.02	3.53	....	0.01	0.27	0.03	....
5. Construction	0.27	2.40	12.62	26.01	0.70	1.82	20.13	0.06	1.23	11.00	4.87
6. Shipbuilding	0.20	0.37	1.06	7.91	5.84	....	16.26	0.19	0.96	4.35	1.38
7. Oil industry	1.81	1.21	3.44	1.45	12.05	0.01	....	....	....	0.69	....
8. Exports	0.38	1.51	2.75	4.45	8.22	0.75	5.15	0.07	1.50	0.45	4.36
9. All other	12.20	16.92	32.28	24.18	71.68	88.08	2.55	7.96	69.53	63.88	24.15
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Emphasis Is Shifting in Race For Alloy Steel Markets

MERCHANDISING, distribution and production of alloy steel are in a state of flux. Companies which have broadened their activities in recent years to include alloy steels are proceeding tentatively, and many of them have not yet struck their stride. Some of the older concerns which expanded into wider alloy fields from the former nucleus of tool steel or carbon steel operations, are engaged in adapting their activities to new and changing markets.

Evidences of this transition are clearly apparent in STEEL's figures on alloy steel distribution for 1935. Reports from companies which in 1934 had alloy ingot production amounting to slightly more than half of the total production reported by the American Iron and Steel institute, increased their production in 1935 approximately 35 per cent above 1934 figures. This compares with an increase in carbon steel ingot production of 30 per cent.

However, much of this gain in 1935 is attributable to forms of alloy steel which did not figure prominently in the totals several years ago. A relatively small increase in stainless steel is indicated, and for many companies a slight recession in output of this grade occurred in 1935.

One inference may be that part of the gain of 35 per cent in total alloy ingot production is represented by the recently introduced high-strength, low-alloy steels. These steels are more appropriately adapted to tonnage markets than any of the other alloy steels and they may become a most important factor in the alloy steel business from the tonnage standpoint. Activity in these alloys is indicated in the new trade names assigned to them in the directory beginning on page 41 of this issue.

Breakdown of distribution figures reveals a sharp increase in the percentage of alloy steels consumed by the automotive industry—72.22 per cent—a new high proportion since 1928, when the auto industry's share amounted to 79.67 per cent of the total.

Other industrial classifications held fairly close to their percentage figures of recent years. Exports held at low ebb; the oil industry took 1.77 per cent of the total—slightly more than in 1934.

Where Alloy Steel Went, 1929-1935

Percentage of Consumption by Groups

	1929	1930	1931	1932	1933	1934	1935
Automotive	61.40	62.23	72.67	77.64	68.28	53.31	72.22
Machine tool	6.34	8.95	6.17	3.54	3.57	4.88	4.47
Oil industry	4.07	4.73	1.16	0.82	1.96	1.52	1.77
Agricultural	4.05	5.94	3.30	1.69	2.07	2.42	2.87
Construction	3.72	1.00	1.09	0.68	0.66	1.55	0.94
Export trade	1.38	1.16	0.88	0.43	0.29	0.58	0.58
Railroads	1.02	2.66	1.83	1.92	0.92	4.11	2.30
Shipbuilding	0.22	0.79	0.52	0.42	0.47	1.21	0.39
Miscellaneous	17.80	12.54	12.38	12.86	21.78	30.42	14.46
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00

How Alloy Steel Was Used, 1929-1935

Percentage of Consumption by Products

	1929	1930	1931	1932	1933	1934	1935
Hot rolled bars	61.87	70.50	54.48	77.28	69.81	68.73	84.62
Cold drawn bars	11.43	5.32	25.65	11.68	19.05	14.99	4.32
Sheets	11.03	0.94	0.69	1.14	1.29	10.20	2.03
Plates	1.04	3.05	1.95	0.65	0.59	1.28	0.78
Pipe and tubes	6.33	8.84	8.60	4.80	3.57	1.75	0.78
Wire	0.05	0.08	0.06	0.28	0.33	0.25	1.15
Structural shapes	0.12	0.42	0.07	0.12	0.01	0.19	0.31
Hot rolled strip	4.43	3.86	1.31	0.66	2.88	0.49	5.01
Cold rolled strip	0.09	0.06	0.04	0.43	0.51	0.35	0.38
Tool steel	1.36	0.80	2.03	1.07	0.48	1.60	0.42
Forgings	2.25	6.13	5.12	1.89	1.48	0.17	0.20
Totals	100.00	100.00	100.00	100.00	100.00	100.00	100.00

World Production of Steel Ingots and Castings

Gross Tons

	1935	1934	1933	1932	1931	1930	1929	1928	1927	1913
United States	33,700,000	25,714,000	23,156,000	13,500,000	25,630,000	40,278,000	55,650,000	50,887,000	44,935,000	31,301,000
Canada	880,000	741,000	403,000	335,000	671,000	1,009,000	1,391,000	1,240,000	907,000	1,043,000
Great Britain	9,900,000	8,850,000	7,024,000	5,261,000	5,203,000	7,326,000	9,636,000	8,520,000	9,099,000	7,664,000
France	6,165,000	6,075,000	6,427,000	5,550,000	7,697,000	9,296,000	9,544,000	9,348,000	8,173,000	4,614,000
Belgium	2,965,000	2,901,000	2,687,000	2,745,000	3,073,000	3,300,000	4,066,000	3,872,000	3,645,000	2,428,000
Luxemburg	1,800,000	1,901,000	1,815,000	1,925,000	2,002,000	2,234,000	2,659,000	2,526,000	2,431,000	.....
Italy	2,175,000	1,820,000	1,755,000	1,369,000	1,430,000	1,746,000	2,109,000	1,932,000	1,570,000	919,000
Spain	550,000	500,000	498,000	525,000	594,000	910,000	985,000	770,000	653,000	238,000
Sweden	860,000	848,000	620,000	520,000	530,000	601,000	683,000	567,000	491,000	582,000
Germany	16,000,000	11,725,000	7,690,000	5,678,000	8,136,000	11,354,000	15,986,000	14,285,000	16,050,000	18,632,000
Austria	330,000	304,000	222,000	201,000	317,000	461,000	622,000	626,000	551,000	2,585,000
Czechia	1,150,000	938,000	749,000	662,000	1,490,000	1,721,000	2,103,000	1,704,000	1,662,000	.....
Poland	905,000	831,000	805,000	542,000	1,020,000	1,217,000	1,355,000	1,226,000	1,226,000	.....
Hungary	350,000	310,000	224,000	177,000	311,000	363,000	505,000	478,000	464,000	.....
Russia	12,000,000	9,412,000	6,790,000	5,900,000	5,333,000	5,610,000	4,828,000	4,206,000	4,150,000	4,181,000
Japan	4,500,000	3,682,000	3,150,000	2,300,000	1,834,000	2,288,000	2,249,000	1,840,000	1,658,000	300,000
India	850,000	798,000	694,000	570,000	625,000	619,000	575,000	410,000	575,000	.....
Australia	600,000	550,000	393,000	221,000	360,000	420,000	460,000	462,000	466,000	.....
Saar	320,000*	1,919,000	1,649,000	1,440,000	1,513,000	1,904,000	2,174,000	2,040,000	1,865,000	.....
Miscellaneous	500,000	450,000	350,000	300,000	350,000	400,000	400,000	350,000	305,000	200,000
WORLD TOTAL	96,500,000	80,269,000	67,101,000	49,721,000	68,119,000	93,057,000	117,980,000	107,477,000	100,876,000	74,687,000

German figures in 1913 are for pre-war territory. Austrian figures in 1913 include the major portion of Czechia and Hungary. Japan's figures include Manchuria and Korea.

*For January and February; from March, Saar output included with Germany; total for year 2,080,000.

World Production of Pig Iron

Gross Tons

	1935	1934	1933	1932	1931	1930	1929	1928	1927	1913
United States	20,700,000	15,978,000	13,222,000	8,674,000	18,263,000	31,441,000	42,270,000	37,832,000	36,289,000	30,653,000
Canada	620,000	438,000	258,000	160,000	466,000	813,000	1,160,000	1,083,000	760,000	1,015,000
Great Britain	6,400,000	5,969,000	4,136,000	3,574,000	3,773,000	6,192,000	7,589,000	6,611,000	7,294,000	10,260,000
France	5,700,000	6,053,000	6,223,000	5,448,000	8,068,000	9,874,000	10,198,000	9,821,000	9,125,000	5,126,000
Belgium	2,995,000	2,860,000	2,667,000	2,705,000	3,180,000	3,311,000	4,030,000	3,843,000	3,692,000	2,445,000
Luxemburg	1,835,000	1,968,000	1,858,000	1,929,000	2,020,000	2,433,000	2,860,000	2,726,000	2,688,000	.....
Italy	675,000	564,000	544,000	481,000	532,000	569,000	718,000	545,000	487,000	420,000
Spain	350,000	338,000	334,000	296,000	468,000	606,000	740,000	552,000	603,000	418,000
Sweden	575,000	550,000	341,000	277,000	411,000	488,000	516,000	431,000	448,000	730,000
Germany	12,300,000	8,602,000	5,183,000	3,870,000	5,964,000	9,540,000	13,187,000	11,615,000	12,893,000	19,000,000
Austria	200,000	132,000	87,000	93,000	143,000	282,000	455,000	451,000	428,000	2,344,000
Czechia	790,000	591,000	491,000	443,000	1,146,000	1,414,000	1,618,000	1,544,000	1,241,000	.....
Poland	380,000	376,000	301,000	196,000	341,000	470,000	693,000	673,000	607,000	.....
Hungary	150,000	138,000	92,000	65,000	157,000	253,000	362,000	281,000	294,000	.....
Russia	12,250,000	10,273,000	7,085,000	6,101,000	4,782,000	4,920,000	4,253,000	3,322,000	3,290,000	4,563,000
Japan	2,750,000	2,400,000	2,019,000	1,525,000	1,385,000	1,635,000	1,491,000	1,520,000	1,263,000	236,000
India	1,500,000	1,331,000	1,065,000	914,000	1,072,000	1,180,000	1,348,000	1,055,000	1,145,000	204,000
Australia	550,000	500,000	336,000	190,000	380,000	308,000	420,000	410,000	550,000	47,000
Saar	300,000*	1,797,000	1,567,000	1,327,000	1,491,000	1,881,000	2,071,000	1,905,000	1,743,000	.....
Miscellaneous	750,000	700,000	600,000	700,000	800,000	750,000	750,000	850,000	750,000	339,000
WORLD TOTAL	71,770,000	61,558,000	48,409,000	38,968,000	54,842,000	78,360,000	96,729,000	87,070,000	85,590,000	77,714,000

German figures in 1913 are for pre-war territory. Austrian figures in 1913 include the major portion of Czechia and Hungary. Japan's figures include Manchuria and Korea.

*For January and February; from March, Saar output included with Germany; total for year 1,900,000.

Exports and Imports of the Principal Countries

(Gross tons—Scrap eliminated)

	EXPORTS					IMPORTS				
Country	1935	1934	1933	1932	1913	1935	1934	1933	1932	1913
United States	980,000	997,000	569,000	367,000	2,648,000	365,000	272,000	358,000	369,000	273,000
Great Britain	2,400,000	2,253,000	1,922,000	1,887,000	4,969,000	1,150,000	1,367,000	971,000	1,594,000	2,331,000
Germany§	3,050,000	2,429,000	1,919,000	2,152,000	6,200,000*	635,000	1,377,000	924,000	680,000	*300,000
France‡	1,900,000	3,030,000	2,672,000	2,410,000	640,000	170,000	200,000	249,000	260,000	185,000
Belgium & Luxemburg	3,200,000	3,345,000	3,150,000	3,311,000	1,550,000†	300,000	306,000	306,000	294,000	†874,000
	11,530,000	12,054,000	10,232,000	10,127,000	16,007,000	2,620,000	3,522,000	2,808,000	3,197,000	3,963,000

*Includes the Saar and Luxemburg. †Belgium only. §Includes the Saar from March, 1935. ‡Includes the Saar from 1932 to February, 1935.

Per Capita Production in United States

	Population in thousands	Output Steel Ingots, Castings, gross tons, thousands	Output per capita, pounds	Pig Iron output in gross tons, thousands	Output per capita, pounds		Population in thousands	Output Steel Ingots, Castings, gross tons, thousands	Output per capita, pounds	Pig Iron output in gross tons, thousands	Output per capita, pounds
1935	127,172	33,700	594	20,700	365	1920	106,422	42,132	887	36,926	777
1934	126,425	25,953	460	16,057	284	1919	105,003	34,671	739	31,015	661
1933	125,693	23,156	413	13,222	234	1918	103,587	44,462	961	39,054	843
1932	124,822	13,500	242	8,800	158	1917	102,172	45,060	987	38,621	846
1931	124,070	25,630	463	18,263	330	1916	100,757	42,773	950	39,434	876
1930	122,775	40,278	734	31,441	573	1915	99,342	32,151	724	29,916	677
1929	121,500	56,433	1,040	42,614	786	1914	97,927	23,513	509	23,332	533
1928	120,013	51,544	962	38,155	712	1913	96,512	31,300	725	30,966	717
1927	118,628	44,935	848	36,511	691	1912	95,097	31,251	736	29,726	700
1926	117,136	48,294	924	39,372	752	1911	93,682	23,676	565	23,649	564
1925	115,378	45,394	881	36,700	713	1910	92,174	26,094	634	27,303	663
1924	113,727	37,932	746	31,406	618	1900	75,995	10,188	300	13,789	406
1923	111,693	44,943	911	40,361	806	1890	62,948	4,277	152	9,202	327
1922	109,893	35,603	726	27,219	554	1880	50,156	1,247	55	3,835	171
1921	108,445	19,783	409	16,688	344						

United States Leads in Striking Gain in World Output; Regains Primacy in Per Capita Use

BY VINCENT DELPORT, European Manager, STEEL

FURTHER marked progress was made in the production of iron and steel throughout the world in 1935. As estimated by STEEL, world output of steel ingots and castings in 1935 was 96,500,000 gross tons, an increase of 20 per cent over 1934, and the largest since 1929. For pig iron, total production was 71,770,000 tons, against 61,558,000 tons in 1934.

The most spectacular increase was made by the United States, up 31 per cent in steel and 23 per cent in pig iron. The share of the United States in world production was 35 per cent for steel and 29 per cent for pig iron, which in both cases is a higher proportion than in 1934.

In 1935 the nations of Europe produced 55,470,000 tons of steel, 14.8 per cent over 1934; for pig iron their total was 44,900,000 tons, an increase of 11.7 per cent.

Even after taking into consideration the fact that the Saar output from March onward is included in Germany, that nation established itself unquestionably as the leading European producer of steel. Germany's total was 16,000,000 tons.

Russia followed Germany in second place in Europe, with 12,000,000 tons. Ranking after Russia was Great Britain with 9,900,000 tons, followed by France with 6,165,000 tons. In sixth place in world rank was Japan, with 4,500,000 tons. These nations ranked in the same order in pig iron production.

In 1935, the proportion of pig iron produced in the world was 74 per cent of the total steel output, compared with 77 per cent in 1934. This indicates an increasing use of scrap.

On the opposite page are given detailed comparisons of world production of steel ingots and castings, world production of pig iron, the exports and imports of principal countries, and per capita production in the United States.

As indicated by the figures mounted on the globe on this page, the United States in 1935 was the leading consumer of steel, averaging 583 pounds per inhabitant. In order came Belgium-Luxemburg, 492 pounds; Germany, 491 pounds; Great Britain, 430 pounds; France, 237 pounds; Russia, 173 pounds; Italy, 163 pounds; Japan, 98 pounds. The order was identical with 1934 except that the United States and Belgium exchanged places at the top of the list.

Except for a 49-pound loss by France, all other figures were an increase over 1934. The percentage of increase was greatest in Japan (85 per cent), and Italy (70 per cent), both of which have been overflowing their borders.

Per capita consumption of steel is figured thus: Domestic production, plus imports, minus exports, divided by population.

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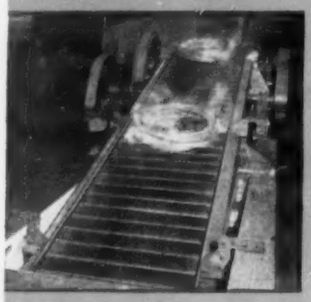

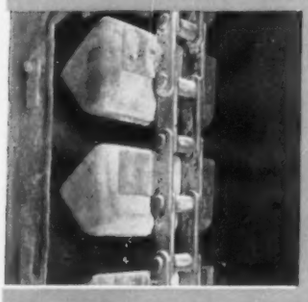

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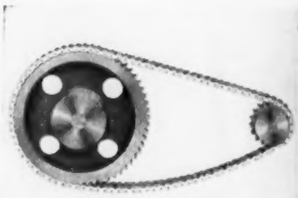

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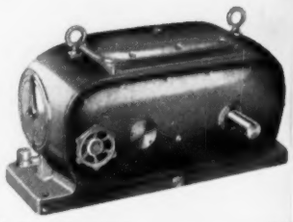

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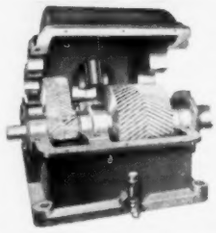

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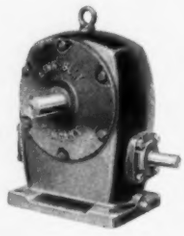

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ENGINEERING PROGRESS

Contents: ...1935

• In this ninth annual composite review of engineering progress in the iron, steel and metalworking industries have been consolidated the opinions of over 150 engineers, metallurgists and operating officials—a true cross-section of industrial America. STEEL gratefully expresses appreciation and acknowledges indebtedness to these authorities whose illuminating statements have made possible the compendium of technical advancement set forth in the following pages:

Welding	214	Power Drives	234
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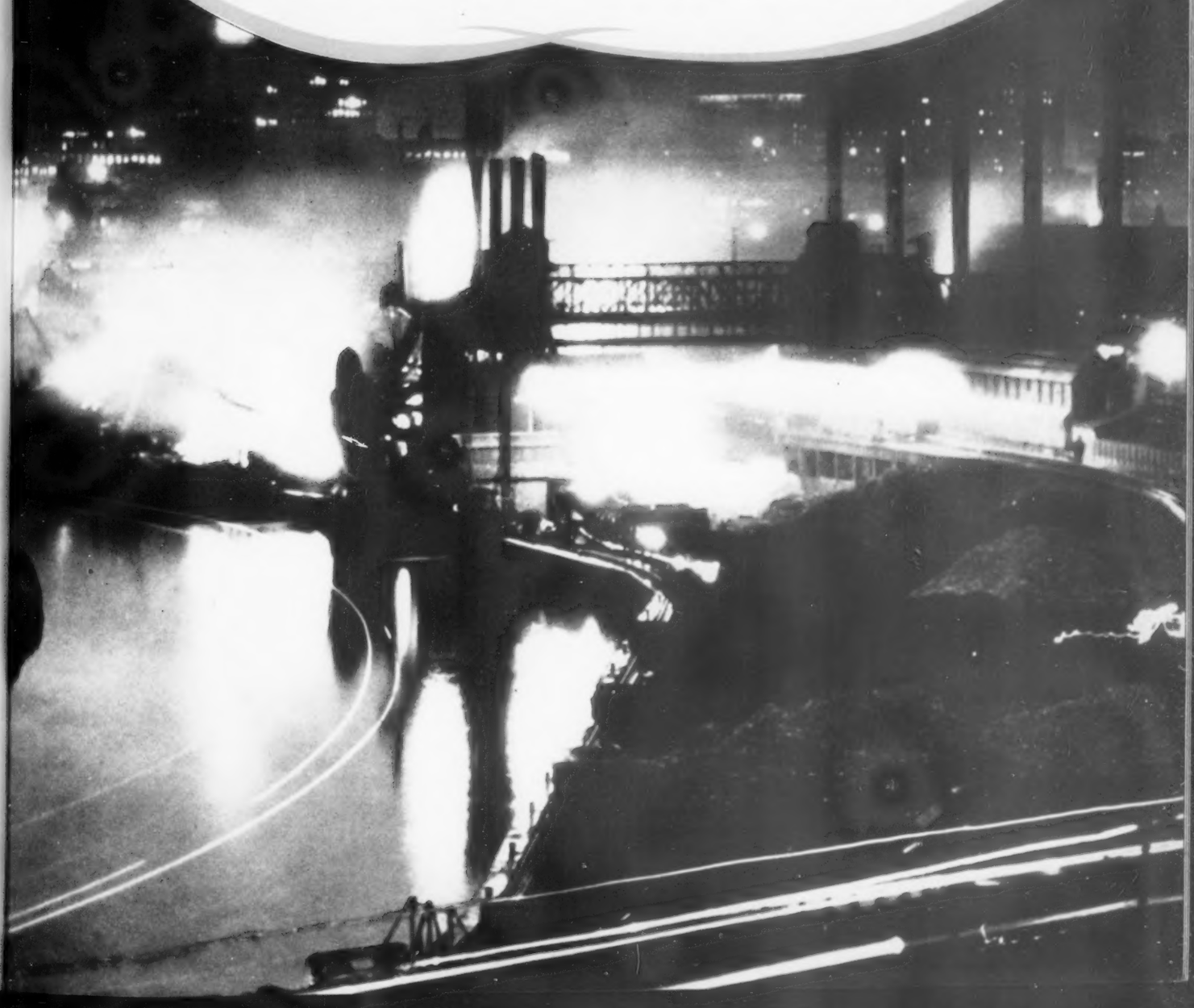


Welding Applications Extended

Fundamental Research, New and Broader Codes and Improved Equipment Expand Uses of Various Processes

IN THE fabrication of metal structures, welding and riveting constitute the major processes, and during 1935 equipment and materials employed in both were improved markedly. Notable in the field of welding were more fundamental research; new codes; extension of the alternating-current arc process; introduction of new electrodes; more welding of low-alloy, high-tensile steels; better welding characteristics of stainless steels; wider acceptance of gas cutting; progress in flame machining; and simplification of weld testing. In the field of riveting, studies of the process; use of larger rivets; cold heading; and higher speeds, commanded attention.

Wider application of various processes to construction of all types of products and increased use of low-alloy, high-tensile steels characterized 1935, in the opinion of J. W. Owens, director of welding, Fairbanks, Morse & Co., Beloit, Wis., who in connection with the latter development points to the trend toward light-weight transportation equipment.

New Welding Rods Needed

Much remains to be done, however, believes Mr. Owens to produce weldable semi-alloy base and filler metals which do not have one or more undesirable fabricating or service characteristics. Also needed is development of carbon steel covered electrodes which can be bent without fracturing the covering, and with which fillet welds can be made having good root penetration, uniform cross-section, free from cutting in at the toes and capable of making sound fillet and butt welds in all positions.

Last year saw marked increase in use of alternating current in metal arc welding, concludes Mr. Owens, the reason for this being that magnetic blow is practically eliminated and with covered electrodes consistently sound welds can be made in all positions.

THE welding art is profiting from fundamental research, reports Gilbert E. Doan, associate professor of metallurgical engineering, Lehigh university, Bethlehem, Pa., who is actively engaged in such research. Arc welds of purified iron made in argon are very ductile and do not age harden. If air is substituted for argon, ductility decreases, therefore, air apparently plays a stellar role in welding steel.

Coatings of cellulose raise the iron values in air, indicating that the ultimate in coating has not been reached, at least not for iron. The coatings on steel wires are more beneficial, says Prof. Doan. Grain size of these welds seems to be closely correlated with the oxygen and nitrogen content of the metal, which is interesting corrobation of certain theories of grain size control.

EXPANSION of application of alternating-current welding and coincidental development of improved alternating-current arc welding transformers, are cited as two of the year's notable accomplishments by O. A. Tilton, industrial engineering department, General Electric Co., Schenectady, N. Y. This progress was made possible by improved quality of heavily-coated or shielded arc type electrodes.

It has become apparent, continues Mr. Tilton, that in the field of heavier current welding—200 amperes and up—the difference in penetration between alternating-current and direct-current welding is inappreciable and therefore the practical elimination of magnetic blow and consistently higher uniform quality of welds made with alternating current are factors influencing wider use of the newer process.

Arcs Made More Stable

In the field of low-current welding, alternating-current arc welding units have eliminated difficulties of arc instability at very low currents. Lower penetration of the alternating-current arc, say Mr. Tilton, makes the method particularly adaptable for welding light-gage sheets. Improvement of alternating-current transformers for this purpose, as well as improvements in electrodes, has extended application of the process into plants handling quantities of sheet metal parts.

C. H. Jennings, research department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., agrees with other commentators that the progress of welding in all fields is attributable to increased experience and fundamental research. In the field of welding equipment, improvements have been made in both alternating-current and direct power units; outstanding is a new welding machine which is a series generator with current adjustment by magnetic shunt in the armature reaction flux path. This machine possesses numerous advantages.

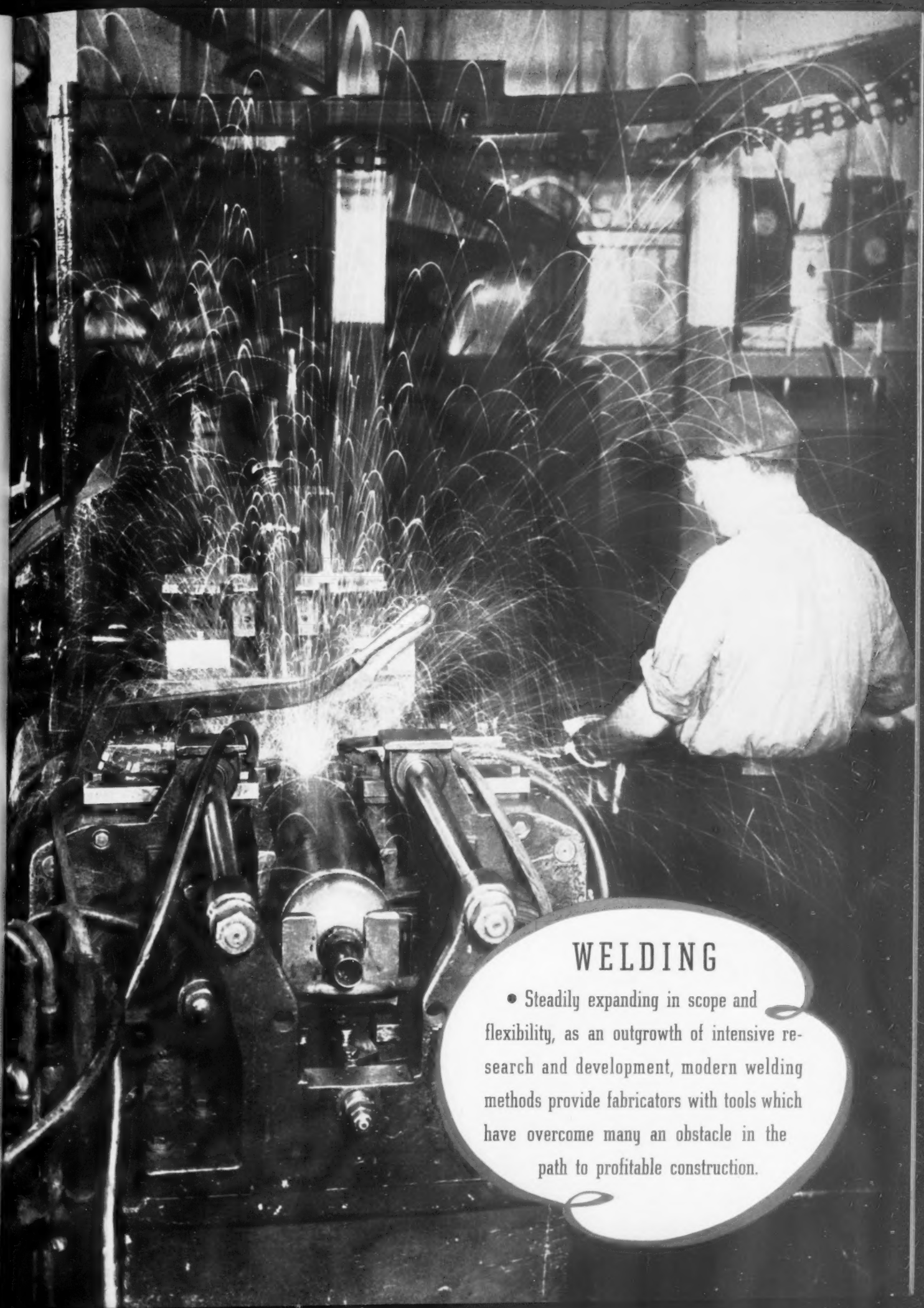
Improved electrodes facilitate stronger, sounder and more uniform welds with less effort, continues Mr. Jennings. Automatic welding of highest quality is now possible with specially prepared fluxed electrodes and addition of powdered fluxes to seams to be welded. Development of low-alloy, high-tensile steel welding is of outstanding importance. Adaptation of welding processes to these steels has opened up an entirely new field for welding and will make possible substantial savings in future engineering structures.

With considerable advancement in the welding of copper, brasses, bronzes, etc., the field of nonferrous metals also has had its share of development. Of importance, concludes Mr. Jennings, is the method of depositing phosphor bronze by the metallic arc process, thereby affording a quick, economical method of depositing wearing surfaces.

AMONG 1935 developments in arc welding, cited by J. F. Lincoln, president, Lincoln Electric Co., Cleveland, are the introduction of electrodes of certain alloys which can be deposited for tool bits, thus tremendously reducing the cost of such equipment; development of electrodes which will deposit other hard surfacing material to withstand wear and impact; increase in the rate of deposition of metal for the usual carbon steels; and successful and economical welding of low- alloy, high-tensile steels.

Comparatively small progress is being made with welding in building structures because the architect does not know how to design for arc welding, the erector does not care to learn to weld, and building codes impose many hindering rules, Mr. Lincoln observes. The past year has seen a tremendous increase in use of shielded arc electrode and a rapidly decreasing use of bare or washed electrode. In a few years, unshielded electrode will be practically eliminated.

In concluding, Mr. Lincoln estimates that at present arc welding is being used in about 10 to 15 per cent of the places where its economical application is now known. In



WELDING

• Steadily expanding in scope and flexibility, as an outgrowth of intensive research and development, modern welding methods provide fabricators with tools which have overcome many an obstacle in the path to profitable construction.

technical development, the welding industry is far ahead of commercial applications.

In spot welding, the main advance of the year appears to J. A. C. Yule, chief of research, Fleetwings Inc., Bristol, Pa., to be the development of a new electrode material for welding stainless steel. This is a hard heat-treatable beryllium-cobalt-copper alloy which is much lower in price and has higher conductivity than previous electrodes of comparable hardness.

More reliable and less expensive spot welding timers have been developed. Electronic timers, for welding such materials as aluminum alloys which require very short and accurately controlled time, have been improved, eliminating the necessity for frequent tube replacement, states Mr. Yule. Low-cost magnetically-operated timers, which can be used for materials such as stainless steel not requiring extreme accuracy of timing, are now available.

Advances have been made in aluminum alloy spot welding, the method appearing to be gaining favor because it is more economical than riveting, comments Mr. Yule. In conclusion, he states that columbium-bearing 18-8 stainless steel sheet and welding rod are showing several advantages for high-temperature service over the titanium-bearing alloys used up to the present.

GILBERT D. FISH, consulting engineer, New York, reports that the committee on bridge welding, appointed about a year ago by the American Welding society, has settled provisions of specifications on design, construction and inspection of welded construction and reinforcement of highway and railway bridges. The specifications, to be issued shortly, will serve as a definite standard in this important field.

New York To Permit Welding

Welding for building construction is permitted in all but a few cities with New York an outstanding example. Because of this city's leadership in building construction, it is important that the building code recognize welding. A new code now under preparation probably will make provision for welding.

A limited number of all-welded buildings were constructed in 1935, and it appears that the proportion of building steel welded is greater than in past years. Furthermore, efficiency and economy of 1935 represent marked improvement over earlier years. Although still a controversial point, Mr. Fish finds in his own practice that welded construction is systematically a little less expensive than riveted construction, as indicated by competitive bids.

At least one high-pressure steam line of considerable length was completed last year, concludes Mr. Fish. A 12-inch line, over a half mile long, was electrically welded in an eastern plant. In the design, full advantage was taken of cold springing to cut in half stresses from temperature deformation.

It is gratifying to note, asserts H. L. R. Whitney, chief engineer, fabricated products division, M. W. Kellogg Co., Jersey City, N. J., that in nearly all cases consumers with experience now look upon Class I fusion welded jobs as the equal, if not the superior, to seamless forged vessels or to large-diameter seamless drawn tubing.

Codes Are Widely Recognized

Numerous codes are now in existence for fusion welded boilers and pressure vessels and these are widely recognized. The department of the interior uses practically nothing but Class I fusion welded pipe for penstocks, on the other hand, the interstate commerce commission has not acknowledged this form of construction. By this stand, Mr. Whitney maintains, the commission prevents the remodeling of hundreds of locomotives and building of hundreds of car tanks by welding.

In the opinion of F. Eder, engineer, Robert W. Hunt Co., New York, welding progress of the past year has been chiefly refinement of existing methods and extension of fields of application. Increase in the use of welding has been material. For instance, recent developments in gas cutting make it possible to cut materials to a great variety of shapes conveniently, and these shapes are readily joined into structures by fusion welding.

Much progress has been made in both fusion and resistance welding of the low-alloy, high-strength steels, especially in constructing railroad rolling stock. New codes adopted during the year were one for fusion welding and gas cutting in building construction, and for welding in pressure piping. Considerable study has been devoted to standardization and unification in connection with requirements for qualification of welding operators and processes. Mr. Eder points out.

WELDING has become more acceptable and is more widely used for shipbuilding and ship repair, states G. H. Moore Jr., Newport News, Va. Doubler strakes of plating have been welded to riveted hulls to increase longitudinal strength, this being an example of satisfactory ship repair applications. Ship welding precedents have increased, due in part to the greater amount of reliable information available.

Efficient training of welding operators and use of improved safety appliances have benefitted operators to a marked degree, continues Mr. Moore. Electrodes have improved in many ways, extruding of coatings contributing much toward this end. A greater variety of satisfactory ferrous and nonferrous metal arc electrodes and gas welding rods have become available and increased use of welding in connection with alloy compositions; this in turn has encouraged designs involving alloys.

Whether to use alternating-current or direct-current equipment, and single versus multiple operator welding, have provoked much discussion and study of the requirements, out of which likely will come valuable guides. Weld testing, observes Mr. Moore, is developing along simpler lines to the advantage of less cost and smoother production.

ENGINEERS of Linde Air Products Co., New York, point out that oxyacetylene cutting and welding is a matter of metallurgy and during the year fundamental knowledge has been advanced. Products have been redesigned to take advantage of the process which is becoming more important as an industrial tool. New codes and rules have permitted wider use of both cutting and welding. It is now permissible to flame cut plate edges of steel up to 0.35 per cent carbon content for boiler and pressure vessel fabrication.

A new process for oxyacetylene welding oil well casings for deep wells received wide acceptance, it is stated. An alloy development, that of introduction of columbium treated 18-8 stainless steel welding rod, also was noteworthy. Use of this rod in conjunction with 18-8 base metals containing columbium or titanium permits fabrication of products which in the as-welded condition have full resistance to corrosion and oxidation, particularly at elevated temperatures.

Improve Chromium Iron Alloys

Improvements were made in the fabrication of chromium iron alloy material, the problems of air hardening in the 4 to 7 per cent chromium and 12 to 30 per cent chromium steels in connection with both welding and cutting being overcome, through alloying additions of columbium or titanium, continue the Linde engineers.

In spite of improvements in oxyacetylene cutting or flame machining, the process can still be considered in its infancy. Making of three-dimensional cuts was more widely accepted in 1935. The fact that a product which requires little finishing can be shaped from a solid block of steel means an important saving. From investigations recently reported, Linde engineers state it would seem that certain features of the oxyacety-

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Heat Treating Practice Refined

1935 Developments in Processes, Materials and Equipment Continue Closely Along the Trends Observed in Recent Years

ALTHOUGH progress in metallurgy and heat treatment was notable in 1935, it consisted principally of advancement in processes, materials and equipment introduced previously; new developments were in the minority. Among the former can be cited improvement in steels and alloys, better control of grain size, increasing popularity of gas carburizing and liquid carburizing, and wider use of controlled furnace atmospheres. New developments of note were an electrical method for localized surface hardening and a high-temperature alloy for furnace resistors.

In connection with the revision of standard S.A.E steels early last year, some 25 or 30 new ones were added. While this gives designers a wider choice in selection, J. M. Watson, metallurgical engineer, Hupp Motor Car Corp., Detroit, feels this constitutes a burden for steel manufacturers. Steel makers should do more extensive educational work to demonstrate that steels now being made can develop all the properties necessary and that it is unjust to be obliged to stock so many varieties.

Purchasing by Grain Size

More and more steel is being purchased on grain size specification, says Mr. Watson, and this is having a beneficial effect upon heat treating for it permits standardization of temperatures, time, etc., and favors a more uniform product. Tied up closely with grain size has been the extended use of liquid carburizing, a process which shortens time and gives a clean product. With continued development of controlled atmosphere furnaces, it is now possible to predetermine accurately the condition of steel after treating.

Mr. Wilson points to a new development in localized heat treating wherein by use of electricity only the parts requiring extreme hardness are treated. This is a rapid process and probably will become one of the major methods for localized hardening. Another important development is a new heat-resisting alloy for furnace resistors, this alloy giving long life and higher temperatures.

IMPRESSIVE to W. B. Coleman, president, W. B. Coleman & Co., Philadelphia, is the broad experimental work and introduction of newer alloying elements into steel. Beneficial results are being obtained through use of various combinations of the recognized and newer elements. This is particularly true in corrosion resisting steels where strength is a factor.

A number of metallurgical advancements are observed by H. M. Bolyston, professor of metallurgy, Case School of Applied Science, Cleveland. Included are expanded use of controlled atmospheres for furnaces and the new type of heating furnaces of the gas-fired radiant-tube type. Prof. Boylston also mentions the new series of high speed steels in which molybdenum is the principal alloying element with tungsten added in a minor amount.

During the past year, nitrogen has been deliberately added to steels containing over 20 per cent chromium to obtain properties not otherwise procurable. Through use of a special high nitrogen ferrochrome, these steels are now made with a fine grain structure which permits them to be forged, rolled, cold drawn and welded without losing desirable properties, states W. J. Priestley, vice president, Electro Metallurgical Co., New York. They respond more readily to heat treatment and retain their resistance to oxidation and objectionable grain growth up to temperatures as high as 2000 degrees Fahr.

METALLURGICAL progress of 1935 extends from refractories to new alloys, in the estimate of R. L. Dowdell, professor of metallography, University of Minnesota, Minneapolis. Much research on deoxidation of steel has accomplished real results in grain size control and the accompanying effect of this control upon the quality of the steel after heat treating. Low-cost, low-alloy steels are finding use in the automotive field and apparently are giving good service.

Activity in nitriding apparently is receding, perhaps largely because of high cost. Industry is becoming more metal minded so that newer developments in alloys are quickly accepted and metallurgists have never been in a better position to supply what is desired. Prof. Dowdell believes we shall see more tool hardening of special alloy steels by interrupted quenching methods and this will result in lower losses of tools and higher production records.

The steel industry is making intensive studies in effect of grain size on ultimate steel properties. Much of this, comments E. F. Davis, metallurgist, Warner Gear Co., Muncie, Ind., has been stimulated by increasing use of carbon molybdenum steels for flat and coiled springs, axle shafts, gears and other parts. Automotive concerns using these steels have placed close specifications for type of grain and this has proved a difficulty for some mills. The present investigations likely will add much to the knowledge of micro-constituents and crystalline development and their effect upon physical and machining properties.

There is growing use of gas carburizers, states Mr. Davis. The latest development is a low-temperature carburizing of gears in a continuous furnace to replace cyaniding. In these furnaces a medium carbon gear steel is carburized at about 1500 to 1550 degrees Fahr. using carbon monoxide atmosphere, and cased to a depth of 0.005-inch. Less distortion is claimed for the gears. An extended use of atmosphere hardening for steel parts, such as springs and various small parts, also is observed.

GAS carburizing, controlled atmospheres, and liquid carburizing and heating mediums continued active fields of investigation and commercial use in 1935 as they did in the preceding year, comments O. W. McMullan, research laboratory, International Nickel Co. Inc., Bayonne, N. J. Much interest exists in controlled atmospheres and use of gas carburizing is spreading even where natural gas is not available.

Two features of furnace design receiving considerable attention are use of rapid circulation of furnace gases from a single burner in large drawing furnaces and use of insulating firebrick to decrease heating up time in hardening furnaces.

Sees More Induction Heating

New applications of induction heating appear as a possibility for future development, Mr. McMullan believes. High frequency furnaces have been used for a long time in high temperature melting but now they have invaded the low temperature field for drying enameled sheets and rust proofing. The next step would appear to be their adaptation to intermediate temperature ranges for heat treating. It may become possible to use induction heating in temperature ranges and for furnace atmospheres now presenting considerable difficulty.

F. T. Sisco, editor, *Alloys of Iron Research*, New York, appraises as the

outstanding development of the year the new heat-resistant alloy which can be used for resistor elements in heat treating furnaces at temperatures of 2300 to 2400 degrees Fahr. This alloy, containing 37.5 per cent chromium, 7.5 per cent aluminum and 55 per cent iron, has many times the useful life of standard nickel-chromium alloy and with its high working temperature can be employed successfully in heat treating high speed steel.

Another development attracting interest is a new quenching operation for high-grade steel wire. The wire is quenched from above the critical is a lead alloy bath maintained at about 580 degrees Fahr. and held for 15 minutes to permit structural transformations. Wire treated in this way is indicated to have higher strength and ductility than the same wire after oil tempering, that is, quenching in oil and tempering in molten lead.

Better Atmosphere Control

Interest in controlled atmospheres is unabated, continues Mr. Sisco. Among many recent improvements in this process may be mentioned the development of vertical tube gas annealers for sheet; development of a producer for carbonaceous gas, which when burned with the proper amount of air, replaces with lowered cost the nitrogen-hydrogen mixture now commonly employed; and increasing use of propane for controlled atmospheres.

A development of interest, perhaps not now directly connected with heat treatment, is the study of low-emissivity steel furnaces for heat insulation. Of more direct interest are recent improvements in refractories including production of a light-weight cellular brick to be used at temperatures up to 1800 degrees Fahr.

For years, concludes Mr. Sisco, mills have studied the possibility and practicability of heat treating rails. A process has been developed recently in which properties of the rail, especially hardness of the head, have been greatly improved. The rails are air cooled to a temperature slightly below critical, then reheated above the critical, held until the rail is heated through, and finally cooled in air with a blast directed onto the top of the rail head.

ATMOSPHERE has played an important part in progress of metals. According to S. K. Oliver, metallurgist, Delco Products, Dayton, O., we have accomplished to a high degree the prevention of atmospheric corrosion of steel in different localities at ordinary temperatures, but when it comes to protection of steel at elevated temperatures, progress has been negligible. He does not doubt that if basic fundamentals and logical research were substituted for explanations now advanced, controlled atmospheres at fabricating and heat treating temperatures would be exactly what the name implies.

If industry will accept the challenge of investigating and correcting existing fallacies dealing with controlled atmospheres, we can expect constructive progress, maintains Mr. Oliver. Use of controlled atmospheres in annealing and heat treating commercial steels as well as tool steels will bring about a renewed advancement of uniformity just as controlled grain size has increased the stability of fabrication and heat treatment of the final product.

Controlled hardenability of ferrous metals is regarded as a most important development by C. L. Harvey, metallurgist, Lamson & Sessions Co., Kent, O. As a result of extensive research, steel users are now able to purchase material having definite hardening characteristics, thus the heat treater is able to make a better product with less trouble and fewer rejections. With all the advance along this line, however, probably only the surface has been scratched.

In equipment, the greatest advancement has been made in heat treating furnaces for temperatures ranging from 2000 to 2400 degrees Fahr., says Mr. Harvey. This equipment has reached a high degree of perfection, but there is a crying need for more facts on effects of various atmospheres within this temperature range.

HARDENING automobile transmission gears in controlled atmosphere furnaces and results of studies into the relative hardenability of medium carbon steels during the past year seem impressive to G. C. Riegel, chief metallurgist, Caterpillar Tractor Co., Peoria, Ill. Two automotive plants are hardening gears by passing them through the muffle type furnace filled with carburizing gas; the gears receive a 0.006-0.010-inch case and are quenched in oil free from atmosphere. The product is clean and file hard. Undoubtedly, this practice will become more popular as a superficial hardening process.

Index of Hardenability

In exploring relative hardenability of medium carbon steels of contrasting sections, Mr. Riegel points out it has been found that a comparison of the planimetrically measured area derived from the hardness penetration curve gives a very exact index of final hardenability of the product of such a mill heat. This is an extension of work by Bain and Davenport and will perhaps eventually supersede in a more exact manner the specification of steel by analysis only.

Liquid baths for carburizing steel have come into their own during the past year, comments W. P. Woodside, vice president, Climax Molybdenum Co., Detroit, who points out that this method, while in use for some time, is really becoming commercial as evidenced by the fact that a larger number of companies are adopting it. Improvements in the bath salts and covering materials account for this wider acceptance.

The process, states Mr. Woodside, permits carburizing light parts to quite definite depths and in short order, thus adding another tool to the equipment of the metallurgist. Among the large variety of parts being carburized in liquid mediums are nuts, bolts, screws, small gears and worms, and many miscellaneous parts.

APPLICATION of convection heating for tempering and drawing during 1935 is an important development, states A. M. Steever, vice president and technical director, Lindberg Steel Treating Co., Chicago. Convection heating consists of transferring heat units by gas, usually air, from the heating medium to the material. Interference with the movement of the gas interferes with heating. No convection heat will penetrate through a solid where radiant heat penetrates with comparative ease by conduction through the solid and radiation again from the opposite surface.

A simple comparison between the two types of heating is to say that convection heat follows the laws of air flow; radiant heat follows the laws of light. Obviously, therefore, explains Mr. Steever, tempering equipment has been designed with this important factor in mind, that uniform heating will occur where uniform air flow is obtained, and rapid heating will occur where large amounts of air are passing the material to be heated at a rapid rate.

Wear Resistant Cast Iron

A metallurgical development which has become of great industrial importance during the past year is the manufacture of Nitricastiron. This material is cast centrifugally for use as cylinder liners, and according to Dr. V. O. Homerberg, division of physical metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., test results have shown the material superior to any other alloy for the same purpose.

Within the year successful production of Nitricastiron in the form of sand castings has been accomplished. Aluminum is a difficult alloying element to introduce into castings and still produce perfectly sound parts. The foundry technique has been solved, however, and castings are being made on a commercial basis.

For several years, says Dr. Homerberg, Nitralloy casting licensees have endeavored to make castings containing aluminum for nitriding, but satisfactory results were difficult to obtain because the aluminum promoted defects. Jerome Strauss and W. E. Ma-

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Forgings Meet Close Specifications

Purchasers Now Insist Upon High Strengths with Minimum Weights, Narrow Dimensional Limits and Good Machinability

MANUFACTURERS of forgings and forging equipment are agreed that today's forgings must be made to more exacting specifications. Users of this product are demanding closer tolerances, higher strengths with reduced weights, and easy and consistent machinability. To meet these requirements, 1935 developments included introduction of improved forging equipment, wider use of controlled atmosphere and controlled temperature heating furnaces, closer metallurgical supervision, more extensive use of alloy steels, and more rigid adherence to grain size specifications.

Surveying the drop forge industry in 1935 from the production standpoint, L. E. Ruby, works manager, Pittsburgh Forgings Co., Jackson, Mich., observes that trends continue as in past years with specifications growing more exacting. The product must be made to closer tolerances and reduction in weight must be made up by higher physical properties. Metallurgical inspection has become more important, and better equipment condition is required to meet the rigorous specifications. Controlled forging furnace atmospheres with automatic temperature control have been essential.

Grain Size Control Important

Two marked developments of the past year, continues Mr. Ruby, were the trend toward better machinability of forgings and control of grain size. Machinability has been improved by more universal use of a free machining steel containing higher manganese and lower carbon. Control of forging furnace temperatures and grain size also has improved machinability. Although of recognized importance in alloy steels, grain size has been given little consideration in plain carbon steels. During the past year it has been found that a fine grain carbon steel produces a more homogeneous forging structure than a steel of larger grain size, also a more uniform hardness after quenching.

Mr. Ruby's company has continued the use of typed dies with marked success. Die life, it has been found, is increased from 50 to 100 per cent because of the dense, fine-grained structure which shells the impression. Problems confronting the industry today, concludes Mr. Ruby, are replacement of obsolete or worn-out equipment, elimination of unnecessary steam line losses, improvement of surface condition of raw steel stock, better control of forging furnace temperatures, and development of a slightly alloyed steel to provide equal physical properties with less forging weight.

SPEAKING also from viewpoint of the drop forgings manufacturer, G. E. Williams, chief engineer, forging division, Transue & Williams Steel Forging Corp., Alliance, O., points out that it was possible during 1935 to put into practice on a production basis many ideas and refinements developed during the depression. As a result, forgings purchasers are obtaining higher quality products. Hardness is more uniform, dimensional variations are smaller and machining costs are lower.

The amount of metal allowed for finish has been reduced, and in many cases the finish on certain forgings has been eliminated entirely through use of coin pressing operations. Improved die designs and better control of heat during forging operations have aided the manufacturer to hold dimensions to smaller variations.

Makers of drop forgings have been able to broaden their activities and increase use of forgings, says Mr. Williams, because various products requiring maximum strength with minimum weight have been redeveloped to include forgings. Not only have the makers of these products increased strength and quality through the use of forgings, but they have reduced costs and acquired a new selling point.

Metallurgist a Key Man

The metallurgist is now playing a more prominent part in the activities of a forge shop than ever before, asserts Mr. Williams. So many improvements and developments have been made in heating furnaces and control of these furnaces that the metallurgist must be consulted to be sure that the forgings produced are of the highest possible quality. Also of considerable help in improving the quality of drop forgings has been the development of new types of alloy steels, including stainless, and more complete knowledge of heat treatment procedure best adapted to these steels.

In the field of larger forgings, little that is new either in practice or equipment was noted in 1935. According to J. L. Cox, chief engineer, Midvale Co., Philadelphia, the absence of a market for capital goods produced a pause in the development of equipment for this class of forgings.

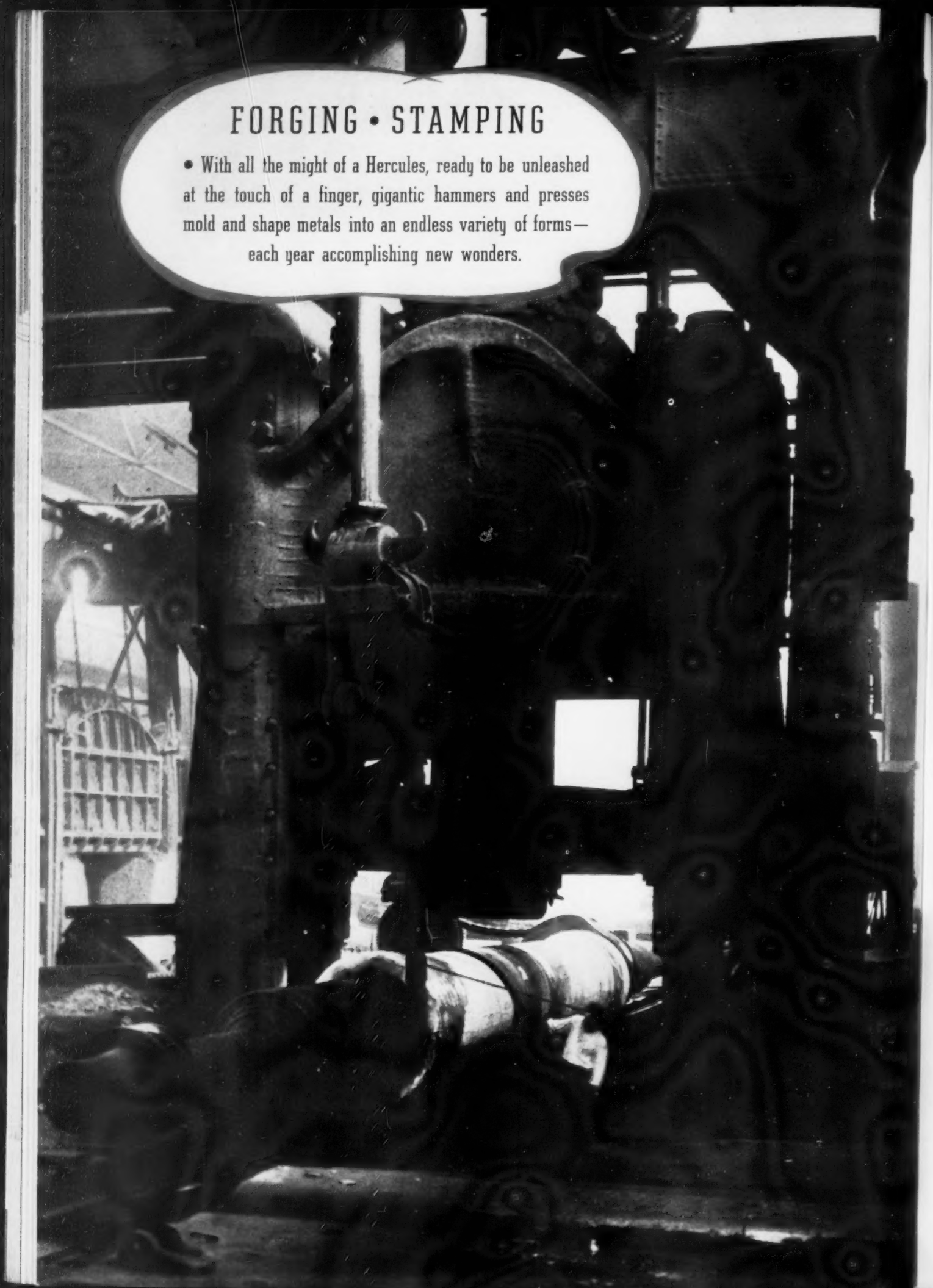
Heavy demand for sheet steel with high surface finish resulted in the construction of a number of continuous mills rolling wide strip — these mills required forged and hardened rolls of unprecedented size and taxed the capacity of existing plants and ability of operators to produce them. The manufacture of such large alloy steel forgings free from inclusions which would mar the perfection of their ground surfaces, and the successful hardening of these rolls is a real metallurgical achievement, maintains Mr. Cox.

Alloys Cut Rust Bill

Use of alloy steels continues to grow in favor not only in the higher alloys but in those of low alloy content. Incidentally, the reduction in the rust bill, effected through the use of these steels, will in time no doubt reach significant figures.

In the opinion of Mr. Cox, there appears to be a growing appreciation of the unreliability of short-time creep tests as well as of the probable non-existence of any such figure as the "limiting creep stress." More and more, the evidence shows that at elevated temperatures, and probably at all temperatures, steels are viscous, yielding slowly under the combined effects of stress and temperature at rates generally imperceptibly slow at atmospheric temperatures but increasing rapidly with rise of temperature and stress. Concluding his remarks, Mr. Cox states there is a tendency toward stricter specifications, more exacting requirements, as well as a wider appreciation of the effect of size upon the physical properties obtainable from forgings.

FORGING practice represents constant effort in endeavor to eliminate the variables and bring the final result down to a point where results are predictable with a high



FORGING • STAMPING

• With all the might of a Hercules, ready to be unleashed at the touch of a finger, gigantic hammers and presses mold and shape metals into an endless variety of forms—each year accomplishing new wonders.

degree of accuracy. This is the statement of R. E. W. Harrison, general manager of sales, Chambersburg Engineering Co., Chambersburg, Pa. Present-day production requirements are as follows: Minimum machining allowance; consistent and easy machinability; controlled flow of metal; accurate sizing; minimum wastage of material; minimum number of forging and straightening operations; and speed, precision, reliability and safety.

Profits from Modern Equipment

A conclusion which is inescapable, points out Mr. Harrison, is that with the equipment produced during the last two years capable of an average of 30 per cent improved economy in steam consumption, plus production rates ranging from 10 to 40 per cent in excess of the rate available on forging equipment designed 5 years ago, the shop equipped with the modern tools is in an immensely stronger commercial position.

If, coupled with the foregoing, we have a continuity of production, plus a material reduction in maintenance costs, plus all the advantages which up-to-date furnace practice can bestow, we have a reduction in production costs which in many cases will run as high as 50 per cent of the original figure, he continues.

Although modern metal cutting tools are capable of rapidly and precisely removing metal at rates available 10 years ago, the fact remains that the high investment in this new style equipment demands that this equipment be used in the most economical way; hence, concludes Mr. Harrison, the modern forge shop equipped with precision forging equipment, producing work with a minimum surplus of stock, is probably the best and most natural element of co-ordination in the total production scheme.

A NUMBER of improvements have been made in construction details in both steam drop and board drop hammers, comments M. S. Reed, sales engineer, Erie Foundry Co., Erie, Pa. A large part of the business booked last year consisted of replacement of obsolete equipment. This is an apparent appreciation on the part of forge shop executives that about 80 per cent of their equipment is obsolete and cannot compete from a cost standpoint with present-day machines. If the present volume of forging business is maintained, even without increase, equipment manufacturers can look forward to a busy year in 1936.

In total sales, the proportion of board drop hammers, as compared with steam drop hammers, continues to show a slight increase, asserts Mr. Reed. During the past year, much interest has been shown in the operation of steam forging hammers and steam drop hammers by compressed air, although this interest was manifested more by study and planning than actual changing over to air operation.

The trend in forging equipment continues toward more rugged types of machines which produce forgings to closer tolerances than formerly were considered practical, states F. M. Rueb, National Machinery Co., Tiffin, O. The first major move in this direction was coincident with invention of the over-arm type heading slide which makes possible the use of a short compact bed frame without sacrificing die and tool alignment. Results obtained from a forging machine that is so many times stiffer were so outstanding that manufacturers of this type of equipment have continued to search for ways and means to still further reduce the stretch and spring in forging machine bed frames.

The company with which Mr. Rueb is connected has during the past year improved its entire line of high-duty forging machines by adding considerable metal around the die box; in longitudinal ribs which strengthen the bed frame between the crankshaft and the die box; and in the crown or support for the crankshaft, so that in addition to providing a more rugged support for the dies, deflections in the crankshaft under heading pressures are practically eliminated.

Another important improvement in the construction of this line of equipment is development of the air-operated friction clutch with the friction-slip relief pinion and new air brake. This arrangement, says Mr. Rueb, makes a compact driving mechanism which increases production through its quicker starting cycle.

Stampings Are More Complicated

Pressed Steel Manufacturers Aided by Higher Quality Drawing Stock; Use More Welding and Brazing

THE stamping and pressed steel industry is moving out of the depression with customers again realizing it is obligatory to pay for service and quality. The industry during 1935 found itself in a position to purchase new equipment capable of reducing costs and increasing efficiency. With mills supplying higher quality sheets of larger size capable of severer forming, the tendency was toward complicated stampings. In the interest of simplification, the practice of making complicated structures by joining small parts by welding or brazing became more general. Greater economy was attained in handling small run production, and improvements in stainless steel encouraged its use for formed products.

The stamping industry showed three trends in 1935, in the opinion of H. S. Lewis, vice president, Parish Pressed Steel Co., Reading, Pa. Of first importance from the standpoint of cost of large quantity production was development of the continuous brazing furnace for joining metal parts or assemblies. Second, development of high quality sheets of larger sizes which was responsible particularly for the fabrication of automobile bodies from fewer individual pieces. The outstanding example, of course, was the drawing of a complete top from one piece.

Progress made toward more economical production of small quantity runs was the third trend, states Mr. Lewis. By a change in methods, advantages of steel construction were retained. For years it has been the practice to make a difficult stamping or part in one operation by a series of successive forming and perforating operations. When small quantities were required, the cost by this method was excessive.

Within the last year or two, the stamper has learned to figure on considerably lower tool investment by making fewer pressing operations and fewer press dies, simplifying the design for press operations, and joining simpler parts by welding. As the heavy duty industries expand, rapid progress probably will be effected along these numerous lines.

THE pressed steel industry is on a fair way to emerging from the depression with customers realizing once again that they are obliged to pay for service and quality. So observes J. Stanitz, chief engineer, Youngstown Pressed Steel Co., Warren, O., who points out that years of depression breed questionable and destructive selling practices. As the depression wanes, buyers are re-educated to normal competition and

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Foundries Aim at High Quality

Heat Treated and Alloyed Castings More in Evidence; Combination Cast and Welded Structures Popular

WHILE no revolutionary advances were recorded during 1935 in the foundry field, consensus of opinion indicates that, with steadily improving business, castings producers made important progress in supplying parts better suited to the job.

Combination of castings with welded assemblies, better understanding of the advantages of heat treatment, improvement of technical control and working conditions in foundries, and further progress in the use of alloys were other general aspects of foundry progress over the past twelve months.

D. M. Avey, editor, *The Foundry*, Cleveland, and serving his second term as president of the American Foundrymen's association, observes that the speeding up of automobile production supplied an increased volume of foundry business which, due to fall model changes, has continued straight through the year. Foundries supplying machinery, pumps, pipe, valves and other appurtenances required in carrying out new construction directly or in part paid by public expenditure likewise have been busy.

Heavy Industries Are A Drag

However, Mr. Avey says, the lag due to stagnation of durable goods purchases still bears heavily upon the industry as a whole, particularly in heavy machinery foundries and in those supplying railway castings.

The foundry industry itself is badly in need of new equipment both to replace that which is obsolete and to provide for increased production in the face of an acute shortage of skilled men. Mr. Avey concludes that foundries are "as ill-prepared to meet backed up demands as they were to meet war service requirements in 1914. Prolonged depression has left them incapable of serving their normal customers from the standpoint of plant and equipment."

In this same connection, J. H. Redhead, president, Lake City Malleable Co., Cleveland, says: "Among some thousands of foundries, the great modernization, rebuilding and re-equipment progress which has been made during recent years appears to have been confined to the customer-owned or captive plants. Why those plants should have been rehabilitated or newly erected while many hundreds of older and independent plants stand idle, presents one of the great business contrasts which should stir the owners of independent foundry properties.

"Perhaps it is fair to question what the independent foundry owners of their trade associations have done during 1935 or will do during 1936 to put their own portion of the industry in a position to serve important consumers on such a basis that their customers will find it impossible to erect plants which destroy the values of existing competing and independently owned plants."

IN THE field of steel castings, the past year unquestionably has indicated a decided advancement in production methods, according to F. A. Lorenz Jr., vice president, American Steel Foundries, Chicago, who is also president of the Steel Founders Society of America. He points out that the recent adoption of cast alloy steels for automobile crankshafts by a large manufacturer represents a new use in a critical mechanical application.

Mr. Lorenz states that one of the most significant developments is the use of steel castings in combination with fabricated steel. Welding engineers are using steel castings in critically stressed parts, enabling them to save weight by the use of preformed structural material. He further notes that it is particularly impressive to witness the advance in the art of heat treating and the installation of scientifically controlled heat treating equipment in foundries, insuring castings made to exact metallurgical specifications.

Alloy Castings More Important

Alloy steels, principally those of the low-alloy type, have increased in importance and in proportion to the total output, declares F. A. Melmoth, vice president in charge of operations, Detroit Steel Casting Co., Detroit. Heat treatment of castings made from these steels has advanced appreciably, both from the standpoint of complete treatment and of what may be described as differential heat treatment, where physical properties to suit the service demand are varied from one part of the casting to another.

Out of this, Mr. Melmoth continues, has grown the tendency to suit the casting to the job, and engineers as a whole seem much more disposed to consult with the steel foundry, both on matters of design and the provision of suitable material analyses and heat treatment.

He says further: "An interesting condition has arisen in some cases, where welded construction, pronounced by many to be the death knell of the foundry, has become a user of steel castings, it being found, apparently, more economical and mechanically sound to build up these composite arrangements using steel castings along with wrought material."

"Research work on solidification problems is adding accentuation to the steel foundry's constant demand for design consideration, and my prophecy would be for an increasing use of specially heat treated alloy steel in casting form, and a marked tendency on the part of engineers to use more and more of them as an outcome of an appreciation of the tremendously increased possibilities made available by changes in design viewpoint."

A SUMMARY of important developments in the steel foundry industry during 1935 should include the following, in the opinion of R. A. Bull, consultant on steel castings, Chicago; More skillful selection based appropriately on heat treatment rather than noticeable increases in the composition grades of cast steel (already numerous); substantially improved production of steeel castings for miscellaneous industrial applications many of them requiring alloy cast steels of small tonnage per order; authenticity given to purchasing requirements for corrosion resistant steel castings, through the American Society for Testing Materials' tentative adoption of new specifications for eight composition varieties of high-alloy cast steel; increased consideration given by steel founders to high costs for electric melting under the experienced conditions of low tonnage output and resulting demand-charge penalties.

Use of steel castings as parts of welded assemblies also impresses John Howe Hall, technical assistant to the president, Taylor-Wharton Iron & Steel Co., High Bridge, N. J., as an interesting development. Where formerly designers of these assemblies were inclined to build them from small parts, they now see the advantage of utilizing castings and welding rolled material to them,

CASTING

• Backed by an inheritance of age-old skill, foundrymen are constantly achieving new success in adapting molten metal to the needs of widely diversified industries specifying cast materials.

thereby reducing cost of the assembly. At the same time the steel casting producer derives a considerable advantage from this procedure, because many of the troublesome lugs and projections are now welded on, instead of being made a part of the casting.

In the steel foundry industry there is a growing use for molybdenum in such parts as dipper teeth, tractor shoes, truck castings, etc., where strength, toughness and wear resistance are of importance, states V. A. Crosby, metallurgical engineer, Climax Molybdenum Co. of Michigan, Detroit. For valves and return bend castings where strength at high temperature is a factor, molybdenum, as one of the alloying elements, has become almost universal. The property of slowing down the transformation rate of steel on cooling is valuable to foundrymen, since it tends to reduce cracking considerably.

Molybdenum in Malleable

"We are informed through reliable sources," continues Mr. Crosby, "that molybdenum in malleable iron has three significant advantages, including less cracking of intricate designs in the mold, less loss through breakage in tumbling and handling in the foundry, and greater uniformity in production efficiency because of the ease with which different sizes of castings are made clear white and free from mottle, using the same heat of metal."

"Ability of molybdenum to improve toughness, wear, resistance, and general uniformity throughout varying sections makes its use in the gray iron foundry especially advantageous. A few of the new uses of molybdenum in gray irons during the past year are: Piercing plugs; piston rings in the low-alloy types, non-heat treated class; air hardened forging dies; brake drums, to eliminate shrinkage; brake drums for airplanes; machine tool castings; chilled and grain roll castings; rolling mill guides, and steam hammer castings of all types. The percentage of molybdenum required usually runs from 0.20 to 1.25 per cent."

D. O. THOMAS, general manager, Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich., sees as the most important development in foundry practice of the past year the improvement in technical control of the various branches of the industry. More technical help is being employed in the foundry industry than ever before, with the result that much guesswork is being eliminated, and the foundry is running on a scientific basis, with astounding results, he says.

New demands have brought out new processes of melting, better methods for heat treatment, fabrication and surface improvement, he declares. Faster annealing with up-to-the-minute temperature and atmospheric controls has great possibilities.

A significant problem that must be met by nearly all foundries is mentioned by Mr. Thomas. It is the matter of apprentice training. With business on the upgrade and resulting from the laxity during the past several years in developing molders, coremakers, patternmakers and others, competition among foundries for the available supply of skilled help is becoming critical.

H. A. SCHWARTZ, manager of research, National Malleable & Steel Castings Co., Cleveland, has viewed with a good deal of interest the introduction of the rotary furnace into the malleable business and into the manufacture of alloys somewhat similar to malleable iron, though more accurately classed as high-carbon steels. He comments: "Whereas a year ago there was only one of these furnaces in actual commercial use, two others which made some pretense at being used for commercial materials and a fourth which was entirely quiescent, there must now be a number of these furnaces either operating or being installed. Some of these seem to be destined for the manufacture of what the writer might call graphitizable steels. The use of these low-carbon modifications of malleable iron, with or without alloying elements, and frequently in an incompletely graphitized state, seems to be quite the order of the day.

"The fact that many of these newer alloys graphitize much more rapidly than malleable iron and that they are frequently used in a definite state of incompleteness of graphitization has made for the use of short-cycle heat treating furnaces in foundries. These furnaces, not essentially different from many formerly used for

(*Please turn to Page* 322)

Die Castings Increase in Size

Thinner Sections, Superior Surfaces and Higher Casting Speeds Also Included in Year's Accomplishments

FROM all indications, die castings business reached a new top in 1935, all branches of the industry sharing in the uplift. New developments were chiefly in connection with production problems, although alloys were further improved and extended. Larger castings with thinner sections and better surfaces was the notable achievement in zinc-base castings. For smaller castings, speeds of production were higher and protective finishes were improved. Some work was done in using die castings as inserts in molded plastic products. Die steels still constitute the major problem in pressure casting of brass, while in the aluminum field, use of the cold chamber process has produced sounder castings.

Advances in the die casting industry in 1935 were largely along engineering production rather than metallurgical lines, although there was no lack of activity along the latter, observes Sam Tour, vice president, Lucius Pitkin Inc., New York. The volume of business probably was the largest ever done by the industry. The tonnage of zinc-base castings increased somewhat over 1934, aluminum increased materially, and brass die casting production also expanded with the installation of several more machines for this purpose.

By closer attention to machine and die construction, control of pressures, and temperatures of dies and castings, it is now possible to produce larger castings of thinner wall section. The most notable example is the zinc-base automobile radiator grille, which has large overall dimensions, many very thin sections all cast integrally and superior surface finish. This improvement in machine, die and production engineering has shown similar results in the aluminum-base die castings field in lowering the minimum wall thickness of castings which can be produced economically.

Make Better Aluminum Castings

Two years ago Mr. Tour described in STEEL the cold chamber process of pressure die casting as compared with the hot chamber process developed primarily for brass casting, and stated that the cold chamber process improvement would find a real application in the production of castings of aluminum alloys as well as of brass alloys. The past year has seen some of this in actual production. Blow holes in aluminum die castings are one of the major difficulties, but by using the cold chamber process much higher pressures are obtainable and lower temperatures can be used, consequently much more solid castings can be produced.

Brass die casting is progressing slowly in this country, states Mr.

(*Please turn to Page* 325)

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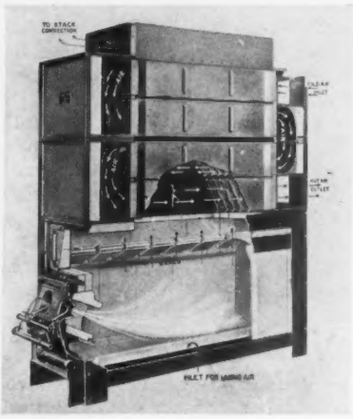

Phantom View—Indirect Type Heater

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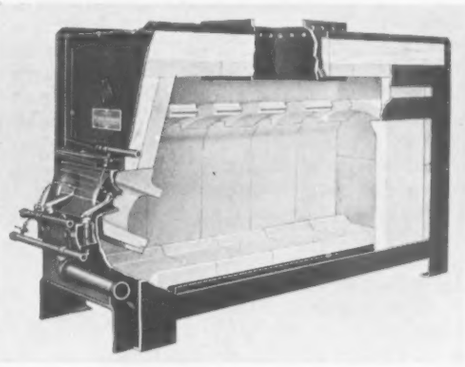

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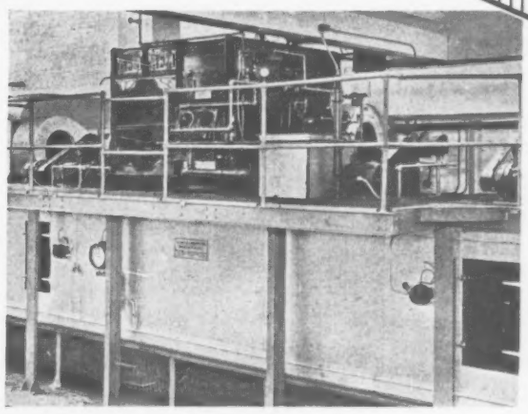

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Finishing Methods Are Improved

Progress Is Made in Surface Treatment; More and Better Coatings Are Available

STEEL benefited greatly in 1935 from the vast progress made in the whole field of surface treatment and finishing. Because better materials and methods have been developed, it has been possible to use steel for a host of purposes to which it previously had not been suited. Great further progress was promised at the turn of the year by reason of the many research programs under way.

"Two or three outstanding developments in the past year are in a measure responsible for the increase in the use of steel by us," says George H. Mamerow, Crowe Name Plate & Mfg. Co., Chicago. "One is the advance made in bright zinc and cadmium plating. Another is the progress by lacquer and paint manufacturers in producing synthetic gums and resins. Heretofore the cost of finishing steel articles was so high that it made the use of steel for certain purposes prohibitive. Today we can produce excellent work with one coat of synthetic enamel which could not be accomplished previously in three or four.

"Another factor," adds Mr. Mamerow, "is the finish of the sheet steel itself. We find that many mills today are spending more thought than even before to produce sheets free from imperfections. Such valuable developments have been effected that on certain articles it is possible for us to enamel products direct from the punch press without grinding or polishing."

REJECTS due to chipping and flaking have been eliminated in many cases by the development of lacquers and synthetic finishes which withstand almost any amount of physical abuse. Because of improved flexibility and adhesion, comments A. Miesem, Roxalin Flexible Lacquer Co., Elizabeth, N. J., these new finishes are being applied to cold-rolled strip steel, in one continuous coat and in any color, and are in no way harmed when the strip steel subsequently is blanked and formed to shape.

Progress in the development of paints designed to resist acids and alkalis, says William H. Gross, Dow Chemical Co., Midland, Mich., makes it possible to paint the interior of tank cars carrying 50 to 70 per cent caustic; this progress also brings about longer life of paint jobs with consequent reduction in labor costs. Mr. Gross, as well as I. R. Messer, Watson-Standard Co., Pittsburgh, regards as of great importance the development of primers for magnesium alloys which not only offer satisfactory protection against corrosion but have the requisite adhesive properties.

Commenting on the gratifying results obtained by using a zinc chromate pigment as an inhibitor for primer coatings on steel, H. L. Acker, Berry Brothers, Detroit, says, "From the confirmed intimate nature of the relationship between chemistry and electricity, certain peculiar primer failures may be accounted for on otherwise apparently outstanding products. The test results with zinc chromate indicate that the electrolytic action plays the most important part by neutralizing any corrosive action, attributed to the release of chrome ions by the water soluble nature of the pigment. This does not take place with such conventional types of primer pigments as iron oxide, basic lead chromate and red lead."

Novelties Are Introduced

Substantial progress has been made in the development of finishes that resist perspiration. Many new novelty finishes are available. One of them resembles cloth tightly stretched over metal; it is produced by spraying cotton or rayon fiber with a modified air gun over a film of synthetic lacquer enamel before it has had time to dry. Much has been done to reduce the drying time of both air dried and baked finishes. Progress also has been made in the development of equipment for mechanizing finishing operations. Such equipment includes ovens, gang mixing tanks, special spraying booths and other units which fit into production lines and greatly reduce finishing costs as well as produce better results.

One interesting product developed during the year is a low-cost rubber paint which is applied over finish coats to protect the finish during further manufacturing operations and during storage and shipment. When the protective coat no longer is required it is loosened at one edge and the film pulled off in one piece. A new luminescent paint has sulphide of calcium as its principal element.

In commenting on a new process of rustproofing which has come into extensive use during the past year and which is obtained by placing on steel surfaces a thin film of iron chromate, F. P. Spruance, American Chemical Paint Co., Ambler, Pa., states that this film serves to polarize the nodes, thus putting a stop to the flow of surface currents. The film provides an excellent primer for paints and lacquers. It further has sufficient elasticity to remain unbroken when the steel which it protects is bent out of shape.

An interesting comment comes from Henry Dreyfuss, industrial stylist, New York. "While much progress has been made in the past several years in the treatment and finishing of metals," he says, "there is a tremendous need for further development, particularly where the use of color is necessary. Choice of metal finishes which are durable is extremely limited where steel is concerned. This limitation has given impetus to the more extensive use of plastic materials. The aluminum industry has gone further than the manufacturers of other metals in developing a variety of good finishes. Stainless steel undoubtedly is one of the coming metals and will be used more extensively when it becomes less difficult to handle and less expensive."

BECAUSE of progress in plating, enamels, lacquers, synthetics and baked finishes, says Clement Thelander, industrial stylist, Rockford, Ill., it now is possible for the designer to get just the right finish best suited to each need. He has at his command an infinite variety of finishes, colors and textures. Careful consideration of color and finish, adds Mr. Thelander, in many cases has added directly and substantially to the salability of products.

Notable improvements have been made during the past year in metal cleaning materials and methods, says R. W. Mitchell, Magnus Chemical Co., Garwood, N. J. These have superior wetting, emulsifying and rinsing abilities. During 1935, adds Mr. Mitchell, there have been several important developments in the lubricant field. There has been a great deal of development recently in the field of condensation of such products as fatty acids with amides, amines and some of the new synthetic alcohols.

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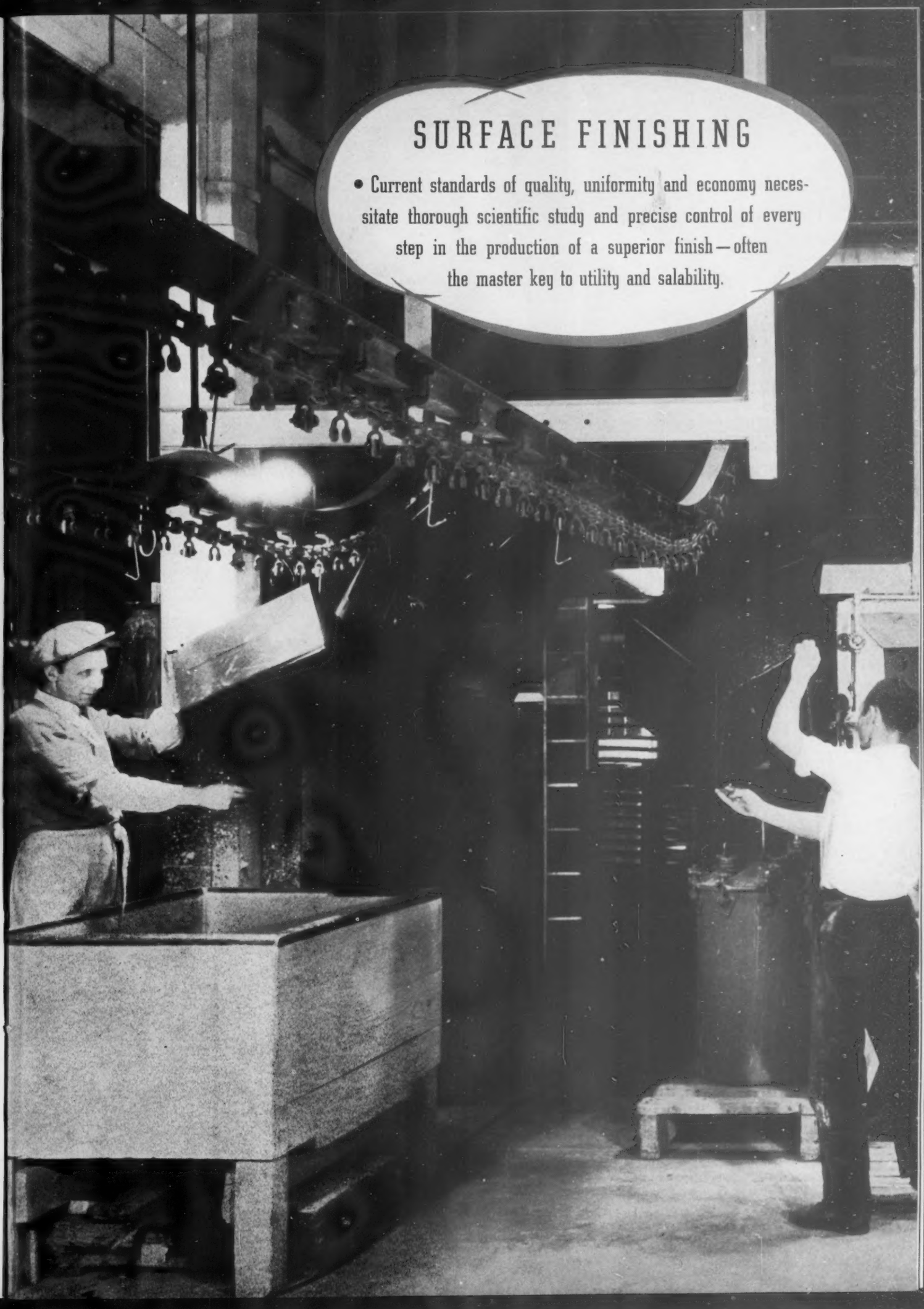
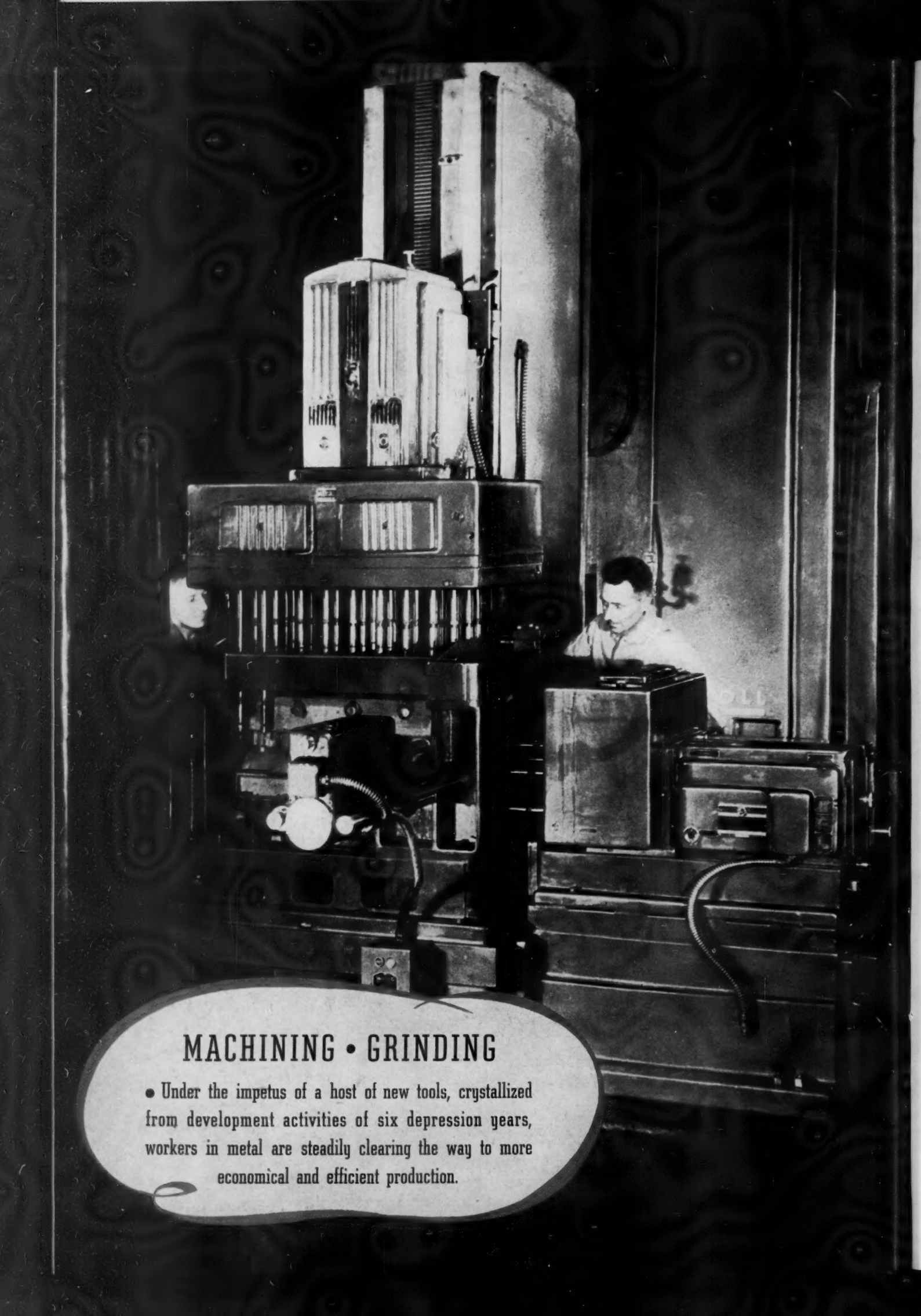


SURFACE FINISHING

• Current standards of quality, uniformity and economy necessitate thorough scientific study and precise control of every step in the production of a superior finish—often the master key to utility and salability.



MACHINING • GRINDING

• Under the impetus of a host of new tools, crystallized from development activities of six depression years, workers in metal are steadily clearing the way to more economical and efficient production.

1935—Big Year in Machine Tools

Exposition Climaxes Era of Redesign; Trend to Standard Equipment with Special Tooling

TECHNOLOGICALLY, 1935 was made impressive by the mechanical innovations and refinements in metalworking equipment shown at the machine tool exposition last September. This gigantic exhibition still echoes through the land, and its influence has been reflected in increased production and higher sales records in almost every plant building industrial equipment.

Why was 1935 an outstanding year for improvement and what made the exposition such an overwhelming success? The answer lies in the mechanical progress engineers have made in design and development. To obtain the highlights of these accomplishments, STEEL has asked the men who envisioned this new era of technology what they consider to be singular features.

From the president of the National Machine Tool Builders' association, Norman D. MacLead, president, Abrasive Machine Tool Co., East Providence, R. I., comes this comment: "To those who attended the recent machine tool exhibition new trends in design of machine tools were evident. Many of these new developments were initiated by the machine tool designers themselves, but others came in answer to definite requirements on the part of users.

Trend to Special Tooling

"One of the outstanding features is the tendency toward purchase of standard tools, specially tooled or with special attachments. This is directly opposed to a former trend which leaned toward specially designed or special-purpose machines. The inference is, that while users appreciate the economies to be derived from special-purpose machines, they feel that because of constantly changing designs of their own products, they will be more economically served by purchasing standard tools which can be readily changed over to suit requirements.

"More extensive use of electric motors was apparent and designers have not been backward in using more than one motor in the machine; many machines use several of them. Built-in motors are more numerous, but there still seems to be a demand for use of standard motors which can be replaced readily in case of breakdown.

"Increased use of the cemented carbide tools has brought about radical changes in turning, boring and milling machinery. Much higher spindle speeds are used, and there is an increased application of antifriction bearings. On account of these higher speeds and increased weight of operating parts, there is a corresponding increase in the power required to drive them.

"As a prophecy for the near future, it is the writer's opinion that electric drive and control will be the predominating feature of all new designs. Possibilities in this field seem to be almost limitless, and there is no question but that electricity will play a leading part in the future machine tool."

ALWAYS alert to activities in all phases of design, R.E.W. Harrison, sales manager, Chambersburg Engineering Co., Chambersburg, Pa., this year views developments in modern drop forging and their relation to current machine shop practice. This thought is significant: "Although modern metal cutting tools such as lathes, broaching machines, milling machines, and precision grinders are capable of rapidly and precisely removing metal at rates varying from 10 to 100 per cent in excess of the rates available 10 years ago, the fact remains that the high investment in this new style equipment demands that this equipment be used in the most economical way; hence the modern forge shop equipped with precision forging equipment producing work with a minimum surplus of stock is probably the best and most natural element of co-ordination in the total production scheme."

Show Mirrors Progress

The fact that it is difficult to say much about this subject without alluding to the machine tool show is exemplified in this contribution from a prominent engineer: "We believe the show contained examples of practically every new idea that has been brought out in machine tools." He noted the additional combination of hydraulic, pneumatic, electrical and mechanical devices, very often one replacing the other, and especially the fact that a good many mechanical units are being replaced by one or another of the other means.

As to the tendency toward general-purpose or single-purpose tools, he says he still insists that the trend requires versatility of more or less general-purpose use, but developed to the highest efficiency for a given single purpose. Yet there is no customer today who would forfeit the versatility feature for the sake of any one machine design that was distinctly and specifically single purpose and would therefore go out of use on any change of design in the work.

Shortening of productive time by higher speeds and feeds, he declares, has emphasized more and more the nonproductive time, for in those machines where cutting and nonproductive time are accumulative, the nonproductive time shows up as a greater percentage of total overall time of production.

What of Welded Construction?

Here is an interesting revelation. He says that there have been several costly experiments in welded design for machine tools, and he refers to several builders who have had unfortunate experiences with this type of construction. He says that they will hesitate a long time before they get away from the good absorbent quality of "dead" cast iron, and go into welded construction, no matter how well it is ribbed, blended, annealed, etc.

In most lines of design he sees wider use of alloy steels. Higher strength materials permit reduction in size of structures. Antifriction bearings are being employed more extensively, he observes, and lubrication systems are more frequently of the pressure type.

Tell Berna, sales manager, National Acme Co., Cleveland, comments: "Speaking only for the automatic screw machine field, outstanding developments have been greater accessibility of machines to make tooling up quicker and simpler. This in turn means that the machines can be used for short runs to great advantage, and their usefulness is extended to the shops where tremendous quantities are not available."

SOME of the outstanding developments in machine tools have been made possible by use of electric drives. This is the opinion of R. S. Elberty, machinery electrification, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. In the past year there have been announced several combination milling machines and planers providing flexible control and ease of setup. This has been made possible by

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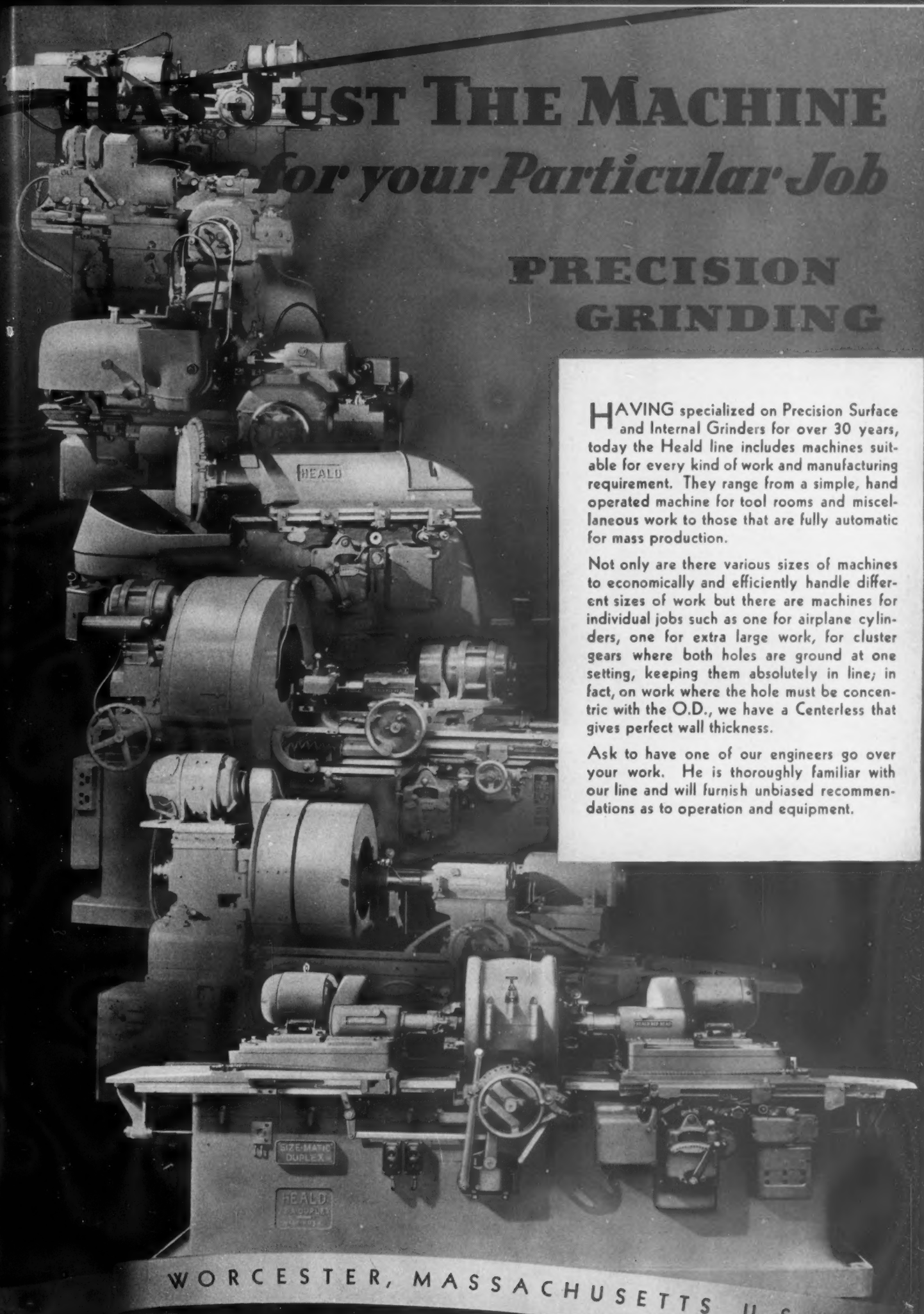

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using electrical drive, providing a set-up operation panel, and controlling the machine from pendant pushbutton stations. The same development has been used on some large milling machines.

Another important factor, Mr. Elberty points out, has been the development of a 10 to 1 single-voltage motor for use on planers, and an electric feed for metal planers. Other recent machine tools use electrical reversing of tools, multi-speed motors to obtain a wider range of speeds with fewer change gears.

His company has also built a wound-rotor motor and control for application to the largest flywheel punch press of its kind. This press is of welded steel construction and brings the flywheel type of press into a field ordinarily covered by hydraulic presses.

Again the machine tool show is mentioned. As stated by Mr. Elberty, this exposition demonstrated that machine tool builders are going to individual motor drives for their machines. In some cases, additional electrical equipment is employed for auxiliary motions, while in other cases these auxiliary motions are obtained by means of various types of hydraulic mechanisms.

SINCE the advent of tungsten and tantalum carbide tools, machines are required to meet new conditions, especially where high-speed cutting tools are used as well as cemented carbide tools, according to E. A. Muller, president, King Machine Tool Co., Cincinnati. To use high-speed cutting tools effectively, the machine must be arranged for comparatively slow cutting speeds, deep cuts and relatively coarse feeds. When cemented carbide tools are used, high cutting speeds are required with reduced depths of cut and feed, he says. Therefore, new types of heavy-duty machines have been designed to meet these requirements which necessitate great rigidity, involving heavier weight, power for very heavy cuts, smooth gear action for high-speed cutting, improved lubricating systems and of great importance, ease of operation without extreme physical exertion on the part of the operator. The horsepower input of machines has in some instances been tripled over the practice of ten years ago.

Electrification Is Notable

In the judgment of Henry Buker, vice president, Brown & Sharpe Mfg. Co., Providence, R. I., the outstanding development in machine tool design in 1935 was the more general use of electrical equipment to take the place of complicated mechanical movements. This not only applies to the motor and magnetic control, but also to solenoids or electromagnets, which are used to operate brakes, clutches, and other changes in various parts of the machine. Mr. Buker also is much impressed by high speeds, the rugged appearance and good lines of practically all machines.

K. A. Munson, general manufacturing department, River Works, General Electric Co., West Lynn, Mass., states his views as follows: "The 1935 machine tool show disclosed many outstanding improvements in machine design from the standpoint of increased rigidity, power and speed for economical use of cemented carbide tools. Five years ago a large proportion of even new machines were not adequate for these tools. Today it appears that machines, in general, have been developed to a point commensurate with the ability of present-day cemented carbide tools.

Further Progress Seem

"Substantial reductions in manufacturing costs are possible through the use of these improved machine tools of 1935, and undoubtedly the machine tool industry during 1936 will still further advance in the gratifying business recovery experienced during the last few months. However, these improved machines of 1935 only emphasize the need for still further developments. Where formerly reduction in cutting time was of prime importance, now manipulation and handling time with resultant operator attendance have become major factors to be reduced.

"Before the next machine tool show I look for outstanding developments in machine tool design to reduce and in some cases virtually to eliminate the need for operator attendance on account of handling and gaging of the work, and manipulation of the machine.

"We have passed through one period in the manufacture of quantity parts when cost reduction activities were focused principally on improving the ability of individual machines to perform specific operations on parts manually loaded and unloaded; then through another period when in parallel with further development of individual machines, the conveyor industry came into existence and the major gains in cost reduction were made by eliminating or reducing the labor of transporting parts from one operation to the next.

"There is everything to indicate that we are entering a period of intensive effort on the part of builders and users of machine tools not only to move material from one operation to the next cheaply and perform machining operations at each point quickly, but also to control the finished dimensions and handle the work in and out of the individual machines mechanically, without such constant attendance by the operator.

"This trend will be accelerated by the rapidly increasing use of separate motors for energizing each individual function of a machine tool, and of electrical control for interlocking and co-ordinating the various functions."

Hydraulic feed and control have shown decided improvement, comments C. N. Kirkpatrick, secretary and sales manager, Landis Machine Co., Waynesboro, Pa. In our own thread cutting machines, he says, we have applied hydraulic control and feed to a marked degree of success. The increased production and the elimination of fatigue on the part of the operator make the hydraulic feature valuable in many plants.

Other than his own line, he is inclined to believe that broaching is one of the most outstanding developments. Who would have thought a few years ago that broaching would encroach upon the field of the lathe, the grinding machine, or the milling machine? While broaching is still to some extent, in an experimental stage, yet we find, for instance, that main bearings of automobile crankshafts are being successfully broached. In this case the finish turning on a lathe is eliminated as well as the finish grinding. Connecting rods now are broached, he explains, to within 0.0003 inch.

Adapted to Flat Surfaces

Broaching also has made substantial gains in the machining of flat surfaces. This operation was normally conceded to the planer or milling machine. With broaching, a finish and smoothness heretofore unattainable in everyday production is produced at comparatively low cost.

Design of electric motors, Mr. Kirkpatrick goes on to say, has been greatly influenced by the design of machine tools. Built-in motors and motors of the flange type are employed to a large extent. Several well-known machine tools on the market today have the motors and controls designed so that their construction will co-ordinate with the design of the machine tool. Without question, the design of electric motors as well as controls will follow the demands influenced by the design of the various machine tools.

The problem of every machine tool manufacturer today, as he sees it, is to design his product to meet higher requirements and higher speeds. Machine tools must be built sufficiently heavy and rigid to accommodate the new high-speed cutting tools. He believes that simplicity of design will be striven for rather than complicated controls which serve in a sales talk, yet in actual practice have no great value.

APPEARANCE of machines in general has been improved by avoiding sharp corners and recesses; control units and attachments have been designed so as to harmonize with the unit as a whole. This is the observation of A. L. Bergstrom, chief works engineer, Timken Roller Bearing Co., Canton, O.

He continues his views with the

(*Please turn to Page* 331)

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Profits from Correct Power Drives

Recent Studies, Abetted by New Equipment, Paint Clearer Picture of Transmission Economies

AMONG important developments in the field of power drives during 1935 was the setting up of a greater appreciation as to what constitutes true economy in drives. When production slumped badly some five years ago, many groups of equipment were found to be too large and unwieldy for economical operation on a part-time basis. On the other hand, high fixed charges on extra drive equipment increased the costs.

Out of this situation grew a study which has made great headway during the past year. Many drive problems have been annalyzed during this period, with a view to ascertaining what type of drive is the most efficient and economical in functioning under given conditions. Some of the important conclusions from these studies to date are summarized in the following.

Drives, like the machines they operate, should be chosen for two reasons: (1) Suitability for the production requirements, and (2) initial and operating costs. Operating costs comprise: (1) Fixed charges, which are determined by the initial cost installed; (2) maintenance expenses, and (3) power costs, including power factor penalties where imposed.

Individual or Group?

Production requirements naturally should predominate, but sometimes other factors which do not affect the suitability and usefulness of the drive influence the decision. Where a thorough engineering investigation shows conclusively that only individual drives will produce satisfactory results, by all means individualize. But where the report indicates that either group or unit drive will give practically equal results, investigate costs and operation of each type. Studies have shown that generally a plant should have some machines unit driven for greatest economy and utility.

Modern grouping is difficult to define because of the many borderline conditions. Generally, groups have been too large and often poorly associated. Some of the generalized rules (and these, like the other statements on modernization, are subject to wide variation as they establish only a working base for study) are: Place a workable limit, say ten machines or a 5, 10 or 50-horsepower motor, to a group; have more than a single group; group sufficient machines to handle one-half or two-thirds of maximum production for the normal periods of demand and the remainder in another group for overflow or high production periods; where several machines operate as a unit, group them, but perhaps individualize certain machines of the unit; sometimes a few large and a number of small machines do not drive well as a group; similar machines, each with widely fluctuating power requirements, usually group well.

Determining Limits

Another rule-of-thumb is that machines which individually require motors of not more than 5-horsepower, sometimes 7½-horsepower size, have such an economic advantage when grouped that every production requirement should be investigated as to its relative importance before individualizing. Frequently larger units may be advantageously grouped; sometimes these limits indicated are too large.

On the other hand, it is generally admitted by transmission and production engineers that unit drives have advantages on isolated machines; on large machines (beginning at about the 5 or 7½-horsepower requirement), especially where the motor operates at approximately full load most of the time; on special or high-speed machines; on machines which, if individually driven, require more than a single motor; where outage is excessive, as for tool changes; on machines which operate independently of any other machine; and under a number of other conditions.

NOW as to costs. Unit drive completely installed often costs two to three times as much as a corresponding group drive for the same machines and so its annual fixed charges, which roughly may be assumed as 15 per cent of the initial cost, are increased proportionately. This increase comprises more total rated motor horsepower at a higher cost per horsepower in the smaller sizes, and the following factors, some of which are often overlooked in preliminary estimates: Wiring and control to each individual motor (in a number of cases the extra wiring alone costs about the same as the lineshaft installed); cost of adapting the machine to unit drive or extra cost of the machine (less motor) built for unit drive; power factor penalty; higher demand charge; additional switchboard and transformer capacity because of greater rated motor load.

Difference in Fixed Charges

There is much argument between the proponents of group and individual drive as to the relative costs of each for maintenance and power. So let us call it a draw and assume both about equal, except for power factor penalty and increased demand charges against the unit installation.

Since fixed charges are generally the largest single item of annual operating costs (sometimes power costs are greater when the plant is operated more than one shift), comparative annual costs on two comparable group and unit drive installations are in close relation to the difference between the costs of installation. Because fixed charges on transmission are practically constant in times of slack or peak production, and also one of the principal operating expenses, the installation with the lower initial cost of transmission equipment has considerable economic advantage. Therefore the more expensive installation must have a corresponding advantage in meeting production requirements to be the most advantageous. Actually overhead, such as fixed charges, is a deduction from profits. Decreasing the overhead permits adding the difference to profits. Of course, in either case drive equipment should be the best obtainable and most suitable for the purpose.

RECENTLY manufacturers of transmission equipment have made many improvements in their products or developed entirely new items. Practically every large manufacturer of leather belts has improved his product or added new tannages to his line. Freedom from stretch, a factor which is responsible for the greatest objection to belts, and improved gripping or friction on the pulley have received special consideration. As a result double leather belts are

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Refractories Meeting New Demands

Development of Insulating and Refractory Materials Attuned to Increasingly Specialized Needs of Users

WITH iron and steel production steadily forging upward and large numbers of industrial furnaces once more aglow, new demands are being imposed on refractories. This was the situation throughout most of 1935, and both producers and users of refractory materials have continued to co-operate to meet these new problems.

As in the past several years, the use of light weight refractories and insulation has been increasing steadily. Confirming this trend, Fred A. Harvey, director of research, Harbison-Walker Refractories Co., Pittsburgh, points out also that in fireclay refractories there has been a continued tendency toward the use of vacuum pressing for both power pressed and auger machine brick, which produces a denser and more slag-resistant refractory.

Mr. Harvey observes an increase in the use of improved Metalkase brick among basic refractory users. In this field also an unburned chrome brick has been introduced, manufactured by at least two companies. The forsterite or olivine refractory has extended its applications and seems headed for wider usage in such equipment as open-hearth bulkheads and copper furnaces, according to Mr. Harvey.

IN CONNECTION with chrome brick, William C. Buell, open-hearth consultant, Cleveland, notes that "the considerable success attending the efforts of an eastern manufacturer of chrome brick three or four years ago to improve quality for open-hearth service lately has caused one or two other manufacturers to effect like betterment in their similar material, with the result that a more satisfactory neutral-basic refractory is now generally available."

Few material changes in the insulating field are noted by Mr. Buell, although better brick of the semirefractory class, having improved qualities as to crushing strength and salvage for reuse are now available. Despite the fact that insulated furnaces (open hearth) are successful and standard in some plants and have been discarded in others, Mr. Buell is of the opinion that there is nothing wrong fundamentally with insulation, when correctly applied under proper conditions. However, he declares, abridged furnaces, poor operation and insulation, like liquor and gasoline, just do not mix.

Citing increasing adoption of chrome brick made under the Ritex process (STEEL, Aug. 19, p. 22), R. P. Heuer, director of research, General Refractories Co., Philadelphia, points out further that dense, nonspalling basic brick continue to displace silica brick above the slag line in basic open hearths. He continues: "The demand for denser, heavier and more volume stable fireclay refractories of all kinds continues unabated. The de-airing process has been developed to high efficiency in the manufacture of brick for blast furnaces and hot blast stoves.

Silica Brick Coming Back

"With improved business conditions many operators of electric furnaces are no longer finding any economy in fireclay brick roofs and are going back to silica brick.

"The introduction of a new type of melting furnace into the malleable and gray iron casting industry points to the entrance of silica brick into a field long dominated by refractories of the fireclay type.

"High-alumina brick, because of high porosity and tendency to shrink when in contact with certain basic fluxes, are being more carefully exploited as refractories for hot blast stoves."

THE refractories laboratory of the Timken Steel & Tube Co., Canton, O., over the past year has been testing in laboratory and service numerous refractory materials in order to select proper runner, ladle and pouring pit refractories, notes Gilbert Soler, manager of research for this company. This work, he observes, has accomplished much in the elimination of nonmetallic refractory inclusions which may be entrained in the steel, resulting in poor machinability and lines of stress or weakness in the finished product. Surface defects due to roof drip or bottom erosion in billet reheating furnaces have been eliminated by proper furnace design and refractory selection, he says.

Superfireclay brick, while not a development of 1935, has met with increasing use, according to L. C. Hewitt, director of research, Laclede-Christy Clay Products Co., St. Louis. Wider application of this brick, which combines high density with resistance to thermal shock, has resulted from better knowledge of service behavior and refinement in manufacturing procedure. One new use for this brick is in malleable furnace bottoms.

Mr. Hewitt is in accord with the general observation regarding rapid strides being made by insulating refractories. He adds that the past year has seen improvements in general properties of such products and an increase in the temperature range to which certain types may be subjected. In this connection, also, has come the development of light weight refractory aggregates which may be used in producing castable shapes, such as furnace door linings.

A new type of refractory cement has been announced, which has excellent bonding properties and is yet so constituted that it will be absorbed slowly, a development which Mr. Hewitt believes should result in increased serviceability of insulating firebrick, particularly in applications where a coating is desirable to decrease surface action, such as flame impingement.

THAT refractories manufacturers are fully aware of their customers' needs is the opinion of K. C. McCutcheon, assistant general superintendent, Ashland division, American Rolling Mill Co., Ashland, Ky., who points out that better operations in steel plants have made possible tests on numerous new materials in the refractory and insulating fields. While information on these new products as yet is meager, by the middle of this year considerable data of value should be available.

One of these new materials, Mr. McCutcheon reports, is a plastic tapping hole mixture which cuts down delays with tap holes when tapping low-carbon steel.

He further observes a decided trend toward the use of clay insulating brick on heating, normalizing and annealing furnaces—a brick which is more refractory and durable even though of lower insulating value.

Gradual increase in the ability of refractory suppliers to furnish materials suitable for the particular re-

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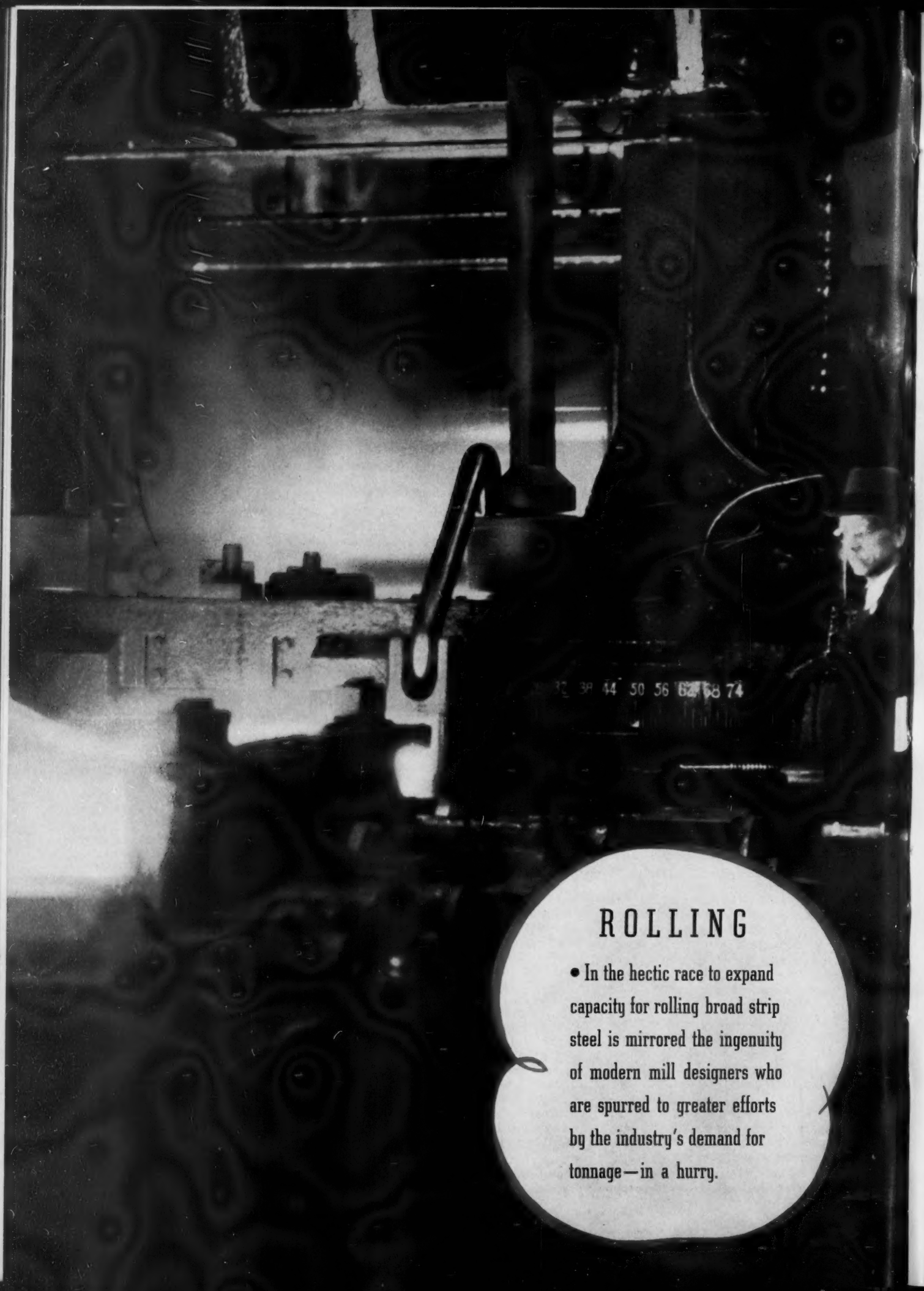

ROLLING

• In the hectic race to expand capacity for rolling broad strip steel is mirrored the ingenuity of modern mill designers who are spurred to greater efforts by the industry's demand for tonnage—in a hurry.

Strip Rolling Speeds Increased

Closer Control of Mill Operation Reflected by Wider Use of Electrical Instruments

PERHAPS the most outstanding impression obtained from even a casual inspection of a 1935 or 1936 model hot strip mill is that steel plant equipment and practices have improved tremendously in the last few years, states R. H. Wright, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in commenting on the 1935 engineering developments in the steel industry. From the heating furnaces with their array of gleaming instruments and combustion control equipment to the coilers and runout tables, the latest developments of modern engineering are in evidence at every step. Mechanical and electrical devices which, a few years ago, were classed as luxuries or gadgets now are accepted as essential equipment. In building to meet the demand for quality of product, the steelmaker overlooks no device which will provide closer control of every operation.

A simple electrical device used to transmit signals between the inspection beds and the roller's station is cited by Mr. Wright to illustrate the close supervision exercised over mill operation. This device permits the inspectors to signal the roller to change the thickness of the strip, the width or the length cut by the flying shear, or to indicate an unsatisfactory condition of either surface of the steel.

CUMULATIVE results of 30 years of co-ordinated mechanical and electrical development make the modern strip mill possible. During 1935, electrical equipment for a number of hot strip mills was ordered or placed in operation. Equipment for two 79-inch mills and one 80-inch mill still was under construction or was being erected at the end of the year.

One 79, one 56, and one 42-inch mill went into operation during the year, he states. Of the six hot mills involved in the 1935 program, the 80-inch mill has the greatest power. The total connected main motor capacity for this mill is 41,500 horsepower. Of the same six mills, the 42-inch mill has the highest delivery speed:—2000 feet per minute maximum. In both instances, new records are established.

The 1935 construction program Mr. Wright advises included approximately 25 cold roll strip, sheet and tin plate reduction mills of various sizes and types; reflecting an unprecedented activity in this field. In addition, a number of tempering mills were under construction and several reduction mills were rebuilt or rearranged to secure greater production.

A 60-inch reversing cold mill will have a 4000 horsepower motor drive for the working rolls and two 1500 horsepower reel motors; making it the most powerful mill of its type, regardless of size. A 42-inch 5-stand tandem mill, recently ordered by the same producer in the Chicago district, will have the greatest power yet applied to a tandem cold roll mill. This mill will be driven by a 500 horsepower and four 1250 horsepower main motors and a 250 horsepower reel motor.

Served by Two Reels

Among the unusual special installations is the 28-inch single stand nonreversing mill designed to roll either aluminum foil or tin plate. This mill, he states, has two reels on the delivery side; one a light reel with a small motor for aluminum and the other a heavier reel with larger motor for steel. The most unusual feature of this installation is that the original aluminum strip is formed and rolled in a special mill direct from molten metal. Another unusual installation consists of two small reversing ring type mills for flat wire and special narrow strip. These mills each have a 125-horsepower main motor and two 20/25 horsepower reel motors.

The individual alternating-current motor drives for runout tables and coilers have become an important part of the modern hot strip mill in Mr. Wright's opinion. Three strip mills placed in operation or under construction during 1935, he points out, require a total of 2100 such motors supplied with power through 20 variable frequency motor generators. Approximately 1200 motors will be equipped with WK-16 switches which serve as disconnecting devices and automatically disconnect a motor in case of a jam.

To secure the utmost advantage from the improvements in rolling processes, steelmakers are utilizing heat treating equipment of the latest type. A steelmaker in Detroit has purchased 12 annealing furnaces and 36 bases and metal hoods to be used in connection with a new strip mill. Each furnace is rated at 230 kilowatts and all units are designed to anneal two 16,000-pound coils of strip 52 inches outside diameter, 30 inches inside diameter and 48 inches wide. In the same plant, a continuous electric normalizing furnace for cold rolled strip was placed in operation. This furnace has a capacity of 5 tons per hour of 19 to 29 gage cold rolled strip 48 inches wide. The normalizing, Mr. Wright states in conclusion, is done without affecting the finish on the steel.

IN THE steel industry as in other industries men, materials and machinery constitute three important factors, observes W. H. Burr, superintendent of electrical and mechanical departments, Lukens Steel Co., Coatesville, Pa. Recent development of machinery and materials, he points out, has effected a degree of perfection which to our forefathers would have seemed impossible. As a result we now have mass production and enjoy a standard of living known in no other country in the world.

Today the greatest burden carried by industry is imposed by man, the third factor with which we have to deal. The increase in efficiency, which can be accomplished by proper selection of employes, correct employe's training and real plant representation should be the main objective of the future. This problem, if handled with the same degree of intelligence as has been used in the development of materials and machinery, Mr. Burr contends, will produce far more satisfactory results. Recently there has been developed a realization of this fact and some progress has been made.

The continued activity in the production of sheet and strip has been most noticeable during the past year. One cannot help but be impressed with the amazing increase in capacity of main drives used on new strip mills recently installed and those now being designed.

The use of reversing hot strip mills with fuel-fired furnaces both in front and back of the main stand in which are rotating strip reels may make possible rolling of longer coils of hot strip with decreased investment, thus lending itself to greater flexibility of operation in direct contrast to mass production on continuous strip mills.

Mr. Burr points out that the flat

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Open-Hearth Insulation Advances

Steelmaking Costs Lowered by Application of New Devices; Details of Practice Studied

DURING the past year so many new devices have been placed in operation in the open-hearth that it is difficult to choose any one outstanding development. In commenting on some of the most important developments, W. J. Reagan, Edgewater Steel Co., Oakmont, Pa., includes the use of copper molds and stools in the steel industry, new types and methods of furnace insulation, new devices for control of furnace atmosphere and roof temperature, new types of furnace design and a continued and absorbing interest in grain size control and slag control.

Improves Mold Life

Use of copper molds and stools while still in the experimental stage, seems here to stay with definite increases in mold and stool life and more than likely an improvement in ingot quality, states Mr. Reagan.

Furnace insulation and design have shown material progress during the past year. It does not seem as though we are obtaining maximum savings in fuel by the use of insulation, but changes in practice are necessary to reduce fuel costs and time and experience will determine the practice necessary. New and higher melting point refractories have been developed by the use of insulation. Often times, continues Mr. Reagan, when furnaces are rebuilt, furnace design is improved, stack flues are insulated and new type dampers installed with a general improvement in steel output and noticeable savings in fuel. Among the newer types of furnace construction — interesting reports are heard about a new top-fired open-hearth now in operation. Another improvement noted, is motor actuation of furnace doors which gives much better control of door operation.

Atmospheric control is becoming more generally used Mr. Reagan advises. A consistent furnace atmosphere (either pressure or vacuum) is a material advantage to the furnace operator especially in view of a growing use of low-draft furnace operation. The direct methods of atmosphere control are still a much discussed question.

Iron oxide control is still an interesting problem. A number of plants are doing considerable work with the petrographic microscope and along this line some plants have developed a visual examination of slag samples that seems to give accurate results as to the slag composition.

Temperature control in the open-hearth also shows progress. Additional installations of the Fitterer couple both here and in Europe with good reports of its value indicates that an important open-hearth problem is well on the way to being solved.

Grain size control probably has had more than its share of the limelight during the past year. Opinions still are varied as to the best methods of control and also as to the effect of various types of grain size.

The bureau of mines is increasing its activities in the investigation of steel problems. At a meeting in Pittsburgh, Dec. 10, metallurgists from a large number of companies discussed the present work of the bureau and suggested future problems to be added to the program. At this meeting some of the bureau's work on production of sponge iron was shown and also their work on the magnetic sampling of slag was discussed.

MANAGEMENT for the past 18 months has been concerned with new finishing capacities, the purchase of which has left little money available for steelmaking improvements, states W. C. Buell, Jr., Engineer, Cleveland. General betterments in many open-hearths are urgently needed, especially where large slab ingots are now being teemed and 1936 holds considerable promise in this direction.

Furnace Control Progresses

Improvements in furnace practice of the past year has been in detail only. Insulation of the furnace and its partial instrumental control are advancing along sound lines in the four progressive plants and assisting in lower costs, Mr. Buell points out. One plant in the East reports a considerable measure of success from an almost completely instrumentized operation.

Increasing demand for ingots from which strip is to be rolled has caused all concerned to give much attention to ladle, teeming, mold, stripping and soaking pit methods, with the result that yield generally has been increased and mill losses reduced and satisfactory surface secured.

During the past year, Mr. Buell advises, two new type soaking pits have been introduced. In one, a recuperating design, the ingots are placed around a central hole through which the combustion gases pass upward and horizontally around the ingots. The other is a cylindrical chamber tangentially fired without regenerator or recuperator, and entirely independent upon insulating methods for its economy.

Installs Third Unit

In conclusion Mr. Buell cites the interest of one operator in the possibility of successfully firing an open-hearth through its roofs. The third experimental unit of this type to be built during the past few years was installed last summer at an eastern plant. It is a 5 or 6 ton furnace with a recuperator instead of the conventional regenerative system.

Use of insulation in open-hearth furnaces has shown the need of better refractories, especially in open hearth roofs, according to K. C. McCutcheon, assistant general superintendent, Ashland division, American Rolling Mill Co., Ashland, Ky. In some places, the application of insulation has been made with no difficulties; in other, trouble has been experienced in the roof and frontwalls. This has been attributed, he explains, to improper design of the furnaces, but better refractories at the danger point may serve the purpose.

The saving derived from tapping larger heats is well understood. Where this practice is followed it means prolonged charging and often filling the furnace with scrap. This and the use of lighter scrap, has changed the service requirements on brick for front and backwalls and indicated the necessity for improved materials or changed the design or both.

All the general interest in open-hearth practice, points out L. C. Hewitt, director of research, Laclede-Christy Clay Products Co., St. Louis, is the further improvement in fire clay nozzles. The advance lies in increase refractoriness without

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Blast Furnace Improvements Needed

Installation of Many Types of Subsidiary Equipment Awaits Appropriation of Funds

SO FAR as attention from parent managements is concerned, blast furnaces continue to be the step children of the industry. Those lusty infants, the continuous mills, continue to get practically all the capital investment plums. Meanwhile, observes W. A. Haven, vice president, Arthur G. McKee & Co., Cleveland, furnace superintendents prepare and revise appropriation requests for badly needed replacements and for improvements that will enable them to keep production costs down to the remarkably low figures accomplished by slow blowing and other depression emergency measures.

As the furnaces are again speeded up, he points out, the old deficiencies in equipment again begin to be felt, and also the need for some changes in practice or designs that will keep coke consumption and losses down to the low figures recently obtained.

Flue Dust a Problem

Clean gas and small checkered stoves, in his opinion, will take care of the additional hot blast requirements but keeping down flue dust at high rates of blowing presents some problems that are as yet not entirely solved. Theoretically, big tops should do the trick, but they have not lived up to expectations. Bigger tops have brought with them some new problems in distribution of stock under the bells. These have grown to such large diameters that difficulty is being experienced in getting enough fine material back into the central part of the furnace. As a consequence, he warns, the chimney effect may get too pronounced from segregation of lumpy ore and big coke in the central portion.

But furnacemen may look forward confidently to a solution of this problem and with it a more complete realization of the benefits that should accrue from the larger furnace volume and decreased gas velocities that the big tops have made possible.

In other directions, charging devices, gas cleaning and handling, stoves, flue dust recovery, mud guns, ladles, blowing engines and many improved types of equipment have been developed during the past few years which await only the availability of funds for application. Mr. Haven directs attention to the fact that they constitute a valuable reserve of money-saving possibilities.

During 1935 the new McKee valve has been installed in hot dirty gas service and in ten months continuous service has further demonstrated that the troublesome problem of valving blast furnace gas finally has been solved in a satisfactory manner.

Another innovation introduced during the year has been a new McKee type large bell rig which makes it feasible to remove the big bell counterweights from the top of the furnace and to eliminate the big bell beam entirely. By this means a considerable amount of weight is taken off the top structure and the danger of damage from gas kicks between the bells greatly reduced. With this rig the bell is centered and adjusted more easily. A smaller bell hoist can be used with this rig than was needed for the old type.

Other initial installations during the year include the combined primary and final gas units in which an electrical precititator is superimposed on a McKee-Feld scrubber. Also an improvement in design of the nested tile checker for hot blast stoves which provides lateral passages between flues, for the more equal distribution of gas or air throughout the checkerwork.

IN THE paper entitled "Modern Blast Furnace Theory and Practice" written by S. P. Kinney and myself for the World Engineering Congress in Tokio in 1929, states R. H. Sweetser, Consultant in Blast Furnace Practice, New York, it was pointed out that the remarkable advance in blast furnace practice in the past ten years in the United States has been made without any great change in design and without any great invention in equipment or in accessories. In a paper entitled "Notes on the Development of the Iron Blast Furnace" by A. J. Boynton and S. P. Kinney, mention was made of "static condition with regard to blast-furnace design, which is likely to last from some time to come."

Thus, for the past 16 years, Mr. Sweetser contends, there has been no improvement on the metallurgical apparatus called the "iron blast furnace" that so successfully makes use of "old man gravity" and the heat exchange between the upward flow of hot gases and the downward flow of the cold solids. No new blast furnaces have been added in this country since 1928, but many have been dismantled.

In the January 7, 1935 issue of STEEL, Mr. Sweetser pointed out that the next excess baggage in blast furnace practice to be eliminated was a part of the several tons of air-blast used per ton of pig iron. Although nothing practical was done in this direction in the United States last year, he advises, the problem received considerable attention, and now is being investigated seriously. There can be no reduction in the weight of oxygen required per pound of carbon burned, he contended, but there can be much less atmospheric nitrogen used in the air-blast without impairing the volume of gas needed for conveying heat from the hearth to the decending column of solid materials in the shaft of the furnace. This likely is to be a major research problem in 1936.

The prime product of the iron blast furnace,—the pig iron itself,—received research attention in 1935 and much was learned about this supposedly rough material,—perhaps enough to put "good" pig iron into the class of alloys of iron. It is now recognized that there is a sharp distinction between pig iron in its molten state ("hot metal") and pig iron in its solid state ("iron in pigs"), other than the difference between a liquid and a solid. The Technique of "cold pig" (the solid state of "hot metal") differs from that of merchant pig iron which is marketed in its solid condition, whereas hot metal is delivered at its destination and used while it is still liquid. Much research work as to the physical and chemical characteristics of pig iron, Mr. Sweetser states in conclusion, is being carried on.

BLAST furnace linings on which 1,000,000 tons of iron were produced on one campaign are considered as giving exceedingly good life, states Jay J. Seaver, vice president, H. A. Brassert & Co., Chicago; but during the year just closed, he continues, certain blast furnace operations have attained production of nearly 2,000,000 tons on one lining, and in some cases auxiliary equipment has had to be improved to keep pace with the life of the linings.

In general, however, blast furnace units of the steel producing plants have not received as much attention from the standpoint of improvements in the past few years as have the finishing departments of these mills. Because of the highly competitive auto-

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Modernization Brings Profits

Companies Which Fail to Keep Abreast of Modern Practice Are Doomed to Failure

INDUSTRIAL companies which fail to take advantage of modern manufacturing equipment and methods are doomed to eventual financial failure. This is the consensus of opinion of 41 executives of important machinery and equipment manufacturing organizations, as expressed in articles which appeared in STEEL during a large portion of the year under the title, *Forum on Modernization*. Short and significant excerpts from these discussions follow.

Recently the time of machining a clutch housing and gear has been cut from 124 to 38 minutes each. The cost per piece has been reduced from $3.10 to $0.95. Total savings per year in production of this piece, based on an 8-hour day, are $6801.20. This means a net profit of 122 per cent annually on the fully equipped turret lathe, costing $4775, which makes this economical production possible—*Charles J. Stilwell, vice president, Warner & Swasey Co., Cleveland.*

Recently a large manufacturer of automobile accessories replaced 39 automatic screw machines built 10 to 12 years ago with 16 new machines of the latest type. The 16 new machines are doing the work formerly done by 39 machines which, in effect, means a production increase of more than 100 per cent per machine.—*Tell Berna, general sales manager, National Acme Co., Cleveland.*

Many customers lately have been selling or scrapping used machines which are far from being worn out and which continue capable of turning out work of average quality in large volume. The reason is that the new machines which replace them will produce more accurate work.—*Henry Buker, vice president, Brown & Sharpe Mfg. Co., Providence, R. I.*

Never before has it been possible to invest money in new machine tools with greater safety and assurance of high returns than at the present time. —*Howard W. Dunbar, general manager, grinding machine division, Norton Co., Worcester, Mass.*

Innumerable cases have come to our attention which prove that cost reduction and quality improvements have resulted directly from the installation of new and improved machines.—*W. W. Tangeman, vice president, Cincinnati Milling Machine Co. and Cincinnati Grinders Inc., Cincinnati.*

The buyer today can be sure he is getting the latest and highest development—a machine which is unlikely to be radically improved for some time. —*August H. Tuechter, president, Cincinnati Bickford Tool Co., Cincinnati.*

A machine tool, after it is installed, is depreciated year after year. The manufacturer who does not replace equipment regularly in an endeavor to equal the depreciated value is headed for a rude awakening.—*C. N. Kirkpatrick, secretary and sales manager, Landis Machine Co., Waynesboro, Pa.*

Tool builders are confronted with selling their product to customers who demand that machines pay for themselves in one and two years—earnings of 100 and 50 per cent, respectively, on their investment. At the same time, these companies are satisfied to invest their surplus funds in government bonds paying 2½ to 3 per cent. It is needless to say good machines tool equipment will earn a much greater dividend than any other investment a manufacturer can make.—*H. C. Pierle, secretary and sales manager, R. K. LeBlond Machine Tool Co., Cincinnati.*

To buy or not to buy? If you want to share in the recovery, you must. If you are in a bad competitive situation, you should. If you hope for profits, or more profits, you can. If you want a good return on investment, you will. Everyone who can, must; for those who do will get the larger share of the improvement in business.—*Harry S. Robinson, secretary, Cincinnati Shaper Co., Cincinnati.*

Electric refrigerators and many other highly developed products could not be built to sell at today's prices were it not for the accuracy made possible by new tools.—*Roger N. Heald, president, Heald Machine Co., Worcester, Mass.*

Real progress requires better products at lower costs. The major equipment manufacturers have intensified their efforts to advance the contribution their equipment can make to this goal.—*Frank H. Adams, general manager, Surface Combustion Corp., Toledo, O.*

There has been such a large number of improvements made in metalworking machinery in the past several years that it behooves management to keep informed as to the profit making possibilities of new and replacement equipment.—*W. D. Creider, general manager, Oilgear Co., Milwaukee.*

Every hour an obsolete arc welder is operated it wastes at least 30 per cent of the operator's time, 14 per cent of the electrodes used and 10 per cent of the power consumed.—*J. F. Lincoln, president, Lincoln Electric Co., Cleveland.*

Let any representative metalworking establishment refrain long enough from buying machine tools of the latest design and that establishment will first cease to be progressive, next cease to be even representative, eventually cease to exist.—*Hugo L. Olson, president, Sundstrand Machine Tool Co., Rockford, Ill.*

In the past few years, particularly in the last three years, greater advance has been made in the refinement of drop forge production equipment than in the several preceding decades. —*Eugene C. Clarke, president, Chambersburg Engineering Co., Chambersburg, Pa.*

The most welcome visitor we have at our plant is the sales engineer who says, "With your permission I would like to make an analysis of such-and-such manufacturing operations in your shop, to see whether or not our improved machines and methods will save you money."—*W. E. Whipp, president, Monarch Machine Tool Co., Sidney, O.*

The plant which will continue to lead the way to lower production costs in the heavy industries is that one which has learned to look to material handling methods for a large portion of operating profits.—*Walter Harnischfeger, president, Harnischfeger Corp., Milwaukee.*

Whether it is advisable, from an economic standpoint, to replace old machines depends on three major factors: Will the new machine tool work faster than the old one? Will it produce better work? Will it reduce set-up time, tool-setting time and idle time?—*August Marx, vice president, G. A. Gray Co., Cincinnati.*

When business finally rounds that

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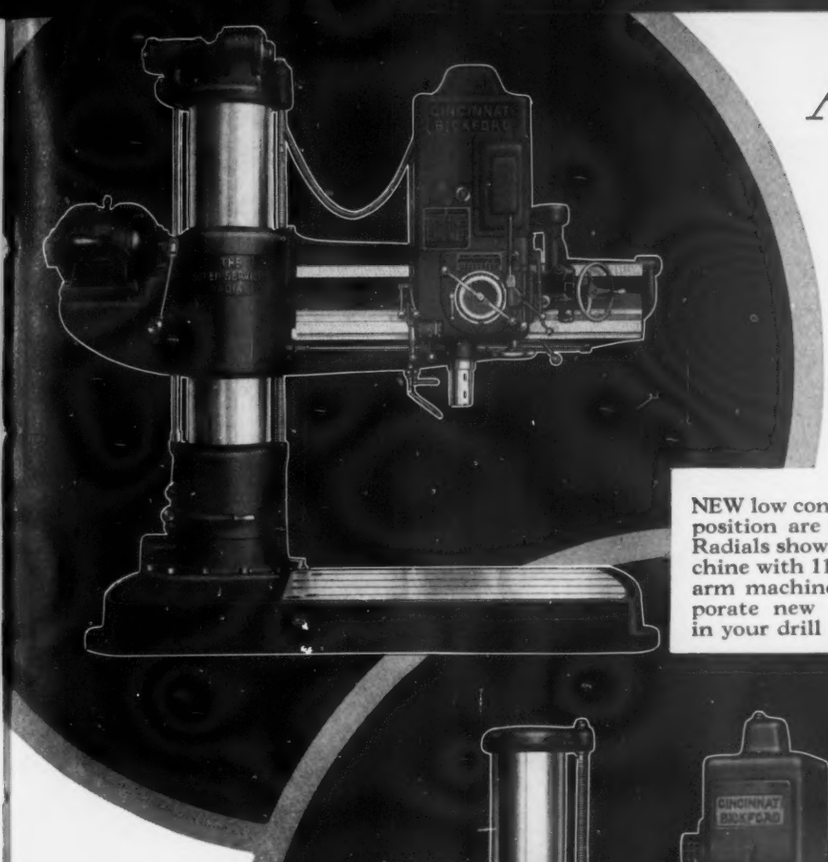
Avoid
Profitless Prosperity

Here's New Efficiency for Your Drilling Departments



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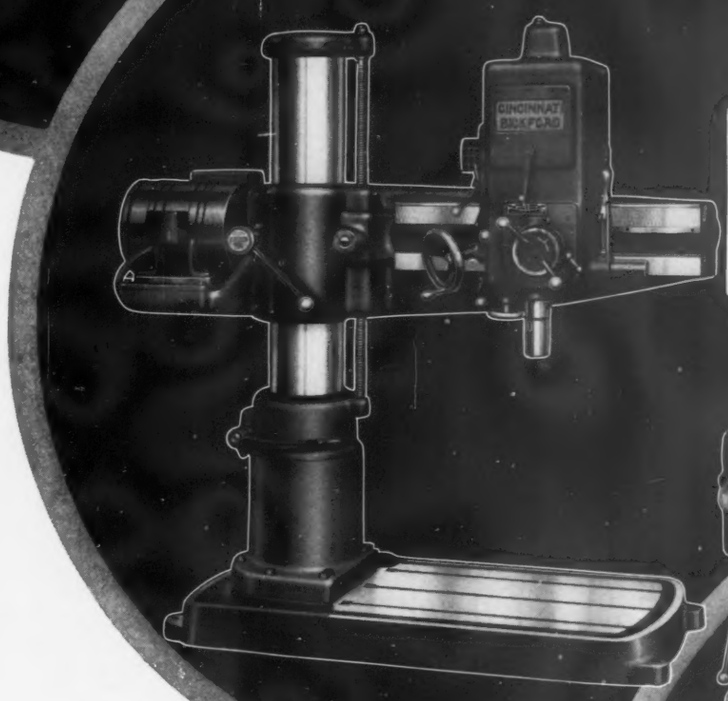

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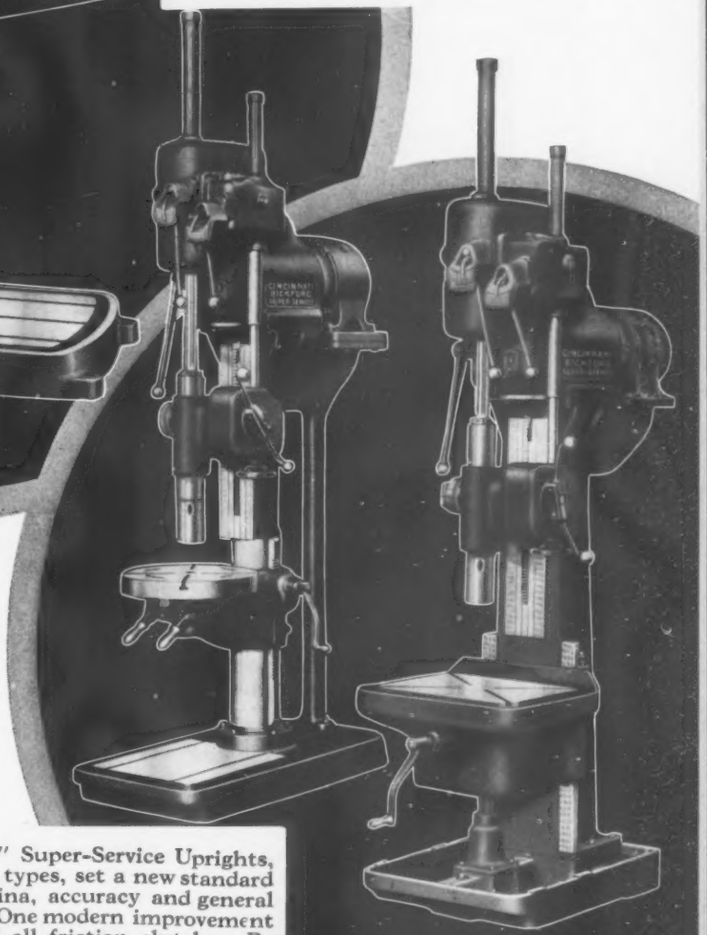

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The Cincinnati Bickford Tool Company

Aerial view of a Lake Superior open pit iron ore mine. The Mesabi Chief is owned jointly by National Steel Corp., American Rolling Mill Co., and Wheeling Steel Corp., and operated by Hanna Ore Mining Co. The area of the mine is about "two forties," or 80 acres. Eventually the two forties at the right of this pit will be stripped and mined

Prosperity Returning to Lake Superior Ore Industry

SIGNS of returning prosperity for the Lake Superior iron ore industry multiplied in 1935. Shipments increased. Consumption outran shipments. Mine stocks were reduced, and supplies at lower lake ports and furnaces were cut below normal.

This combination, with rising demand, puts the industry in the most favorable position since 1929. Producers appear confident of further substantial gains. Because of low stocks, if steelworks operations show the expected rise, an early and strong movement of iron ore is almost certain to result this year.

In 1935 the mines forwarded 28,362,368 tons by vessel, 27.4 per cent more than in 1934. This was the third consecutive yearly increase. The total was nearly midway between the 3,589,000 tons in 1932—the low point in the depression—and 66,166,000 in 1929, the all-time peak.

Since 1930, covering the depression, the industry has been moving ore at an annual average rate of 19,800,000 tons, or 35 per cent of the 56,100,000 tons average in the preceding five years, the country's most prosperous period. To find a lower consecutive five-year average figure than this 19,800,000 tons, the industry must go back in its records to 1894-1898.

As an offset against the punishment the industry took from the depression, as indicated by output, there is only the comfort that the life of merchantable reserves has been extended about five years. Some of the steel interests have been wondering whether iron ore is a liability or an asset, though they have been getting rid of their poor properties and acquiring good ones.

Consumption of Lake Superior ore, approximately 30,500,000 tons, was 9 per cent more than shipments. Except in 1932, when the mines were practically shut down, 1935 was the first year since 1927 when the amount of ore used exceeded the new tonnages.

Stocks Reduced 3,300,000 Tons

Stocks on hand at lower lake ports and furnaces Jan. 1, 1936, totaled about 31,000,000 tons. This was the smallest for this date in more than 17 years. It is 18 per cent less than the average of 36,800,000 tons for the preceding 17 years. At the outset of 1935 the stocks amounted to 34,373,000 tons.

Steelworks operations at about 50 per cent for four months will reduce these stocks to 19,000,000 tons by May 1, or 17 per cent less than the average for the preceding 17 years.

Ore consumption increased and stocks decreased despite the diminished ratio of ore to iron and steel production. While 1.53 tons of iron ore was used for every ton of iron and steel made in 1913 the ratio showed a steady decrease to 0.84 to one in 1932. In 1933 it rose to 0.86, in 1934 to 0.92, and the final figures for 1935 are expected to show another slight gain. Iron and steel production is obtained by adding the output of pig iron, other than basic and bessemer, to steel ingots and castings.

One reason for the apparent change in the trend during these past three years is the growing insistence of some consumers for steel made without the use of scrap, or a minimum of scrap. Both merchant blast furnaces and the steelworks have felt this demand, and generally ascribe it to increasing use of alloy steels, scrap from which contaminates the new product, and makes it undesirable for certain purposes.

Ore was produced last year from approximately 125 mines, the number varying little from those active at some time during the season in each of the preceding two years. In 1932 only 57 reported some shipments, and probably less saw actual work in new production. By doubling the active mines last year, output was raised nine times that over 1932.

In 1929, year of heaviest shipments, only 161 mines were operated. The largest number ever to operate was 261 in 1918, when production totaled 62,800,000 tons.

The number of active mines has come to have little meaning as a gage of a year's operations. For the past several years the industry has shifted its operations from one mine or group to another, in order to provide work. This procedure has raised costs, although open-market prices have remained unchanged for seven years.

One benefit resulted, however, when labor organizations repeatedly made determined drives to enroll the miners, and failed. They failed even after they had enlisted the sympathies of federal mediators, who stepped in at the organizers' requests—only to find the men at work, and nothing to mediate. The men have wanted work, not organiz-

ation, and the prospects are better for more work this winter and the coming summer than in any year since 1930.

An outstanding development in the year was Republic Steel Corp.'s acquisition of the Corrigan, McKinney Steel Co.'s mines, with other Corrigan-McKinney properties. It was part of Republic's testimony in the merger suit that Republic obtained about 50,000,000 tons of ore reserves through Corrigan-McKinney to round out its own reserves of 122,000,000 tons.

This raised Republic to a more important position among the holders of Lake Superior iron ore, although of its own 122,000,000 tons reserves only about 50,000,000 tons generally are believed to be located in the Lake Superior district. While Republic ranks third in steel ingot capacity, it evidently does not come up to that position in lake ore reserves.

There is no other subject concerning which steel companies are so "touchy," as the amount of their reserves. One reason is to be found in the fact that "reserves" is an indefinite term; it may mean good, merchantable ore, or again it may mean some of such ore, plus other material which is not merchantable as mined.

Ten Leaders in Ore Reserves

From the tax records, and their own experts' studies, the steel companies, however, have a fairly reliable line on how they rank in the matter of reserves of ore, merchantable, or easily made merchantable by present practical methods.

First in this list is the United States Steel Corp., credited with about 55 per cent of all such ore, roughly 700,000,000 to 800,000,000 tons. Its ingot capacity represents 45 per cent of the industry's total.

While unanimous agreement on the question of reserves manifestly would be impossible, one important steel interest—which ought to know—places the list of possessors in the following order: United States Steel, National Steel Corp., Youngstown Sheet & Tube Co., Cleveland-Cliffs Iron Co., Jones & Laughlin Steel Corp., Bethlehem Steel Corp., Republic Steel Corp., including Corrigan-McKinney; Interlake Iron Corp., and Inland Steel Co.

In ingot capacity the nine leaders are: United States Steel, Bethlehem, Republic, Jones & Laughlin, Youngstown, National, American Rolling Mill Co., Inland, and Wheeling Steel Corp.

National is second in ore reserves, but sixth in ingot capacity. Bethlehem is second in ingot capacity, but only sixth in lake ore reserves. Bethlehem, as well known, has large reserves in South America. Furthermore, it could draw heavily on other sources than its own in the lake district. With Youngstown and Interlake's reserves it would undoubtedly be second in the list. It now own half of the Mahoning mine, one of the largest properties in the district.

Mining companies received little relief from high taxes in 1935. Although they won their suit for a reduction in assessments in the Minnesota circuit court late in 1934, the state appealed to the supreme court, where the question still rests. The state did not change valuations—1935 being an off year—but it slapped on the highest levy in its history. Occupation taxes were relatively light owing to the slow rate of operations. The total tax bill for the Minnesota mining companies for 1935 probably will be slightly lower than in recent years.

In Michigan the tax situation was made easier when total valuation for mines and reserves for 1935 was fixed at $62,370,000, a reduction of $3,083,000 from 1934.

Steel Wage Rates Steady; Employment Increased

LABOR in the steel industry benefitted from increased employment in 1935, although hourly wage rates were unchanged.

Since the beginning of the depression steel labor has taken two reductions in hourly rates, and has received two increases, these cancelling the reductions and restoring the rates to the 1929 high.

The rate for common labor held unchanged at 44 cents an hour from August, 1923, to Oct. 1, 1931, when there was a 10 per cent reduction. In May, 1932, at the bottom of the depression, there was another cut of 15 per cent, to 33.7 cents an hour. This continued in effect until the code rate was adopted which generally provided for 40 cents an hour, or an advance of 18.7 per cent.

In April, 1934, the industry made a voluntary increase of 10 per cent, to 44 cents. The actual rate had little significance as to the number of hours worked, the problem of employers and employes alike being how to provide, or how to obtain, work, in contrast with former years when efforts were made to reduce the number of hours worked.

The average number of hours worked per week in October, when steelworks were operating at 52 per cent, which was close to the average for the year, was 36.8, compared with 25.4 in October, 1934. Carrying out the comparison between these two periods, the average hourly earnings were 65.4 cents, against 64 cents in 1934. The number of employes on the steel industry's payroll was raised to 436,554 from 381,431, and the amount of the payroll was increased to $51,456,368 for the month, from $32,723,909.

Common Labor Wage Rates in Steel Industry

	Wages for 10 hrs.	Per cent advance	Per cent advance over 1915
1915	$2.00	....	....
Feb. 1, 1916	2.20	10	10
May 1, 1916	2.50	13.6	25
Dec. 15, 1916	2.75	10	37.5
May 1, 1917	3.00	9	50
Oct. 1, 1917	3.30	10	65
April 16, 1918	3 80	15	90
Aug. 1, 1918	4.20	10.5	110
†Oct. 1, 1918	4.62	10	131
‡Feb. 1, 1920	5.06	10	153
†May 16, 1921	4.05	*20	102 5
July 16, 1921	3.70	*8.6	85
Aug. 29, 1921	3.00	*18.9	50
Sept. 1, 1922	3.60	20	80
April 16, 1923	4.00	11	100
††Aug., 1923	4.40	10	120
Oct. 1, 1931	3.96	*10	98
May 16, 1932	3.37	*15	68.5
Aug. 19, 1933 (Code)	4.00	18.7	100
April 1, 1934	4.40	10	120

(No change since)

*Reduction.

†Basic 8-hour day in effect; time and one-half for overtime.

††Twelve-hour day abolished. Labor placed on 8-hour shift paid at rate of 50 cents an hour.

The rates prior to Oct. 1 were those announced from time to time by the United States Steel Corp.

Labor Relations Peaceful

Employe representative groups of several of the steel companies late in the year petitioned for wage increases of 10 per cent or more, but these were held in abeyance, pending further improvement in steelworks operations.

The year was notable for the generally peaceful relations which existed between employers and employes. The industry was affected more by strikes and disturbances in some of the leading steel consuming industries, and while these were threatening in the first half of the year the labor skies cleared considerably in the last half.

Some significance was attached to the withdrawal of John L. Lewis, president of the United Mine Workers of America, from active partici-

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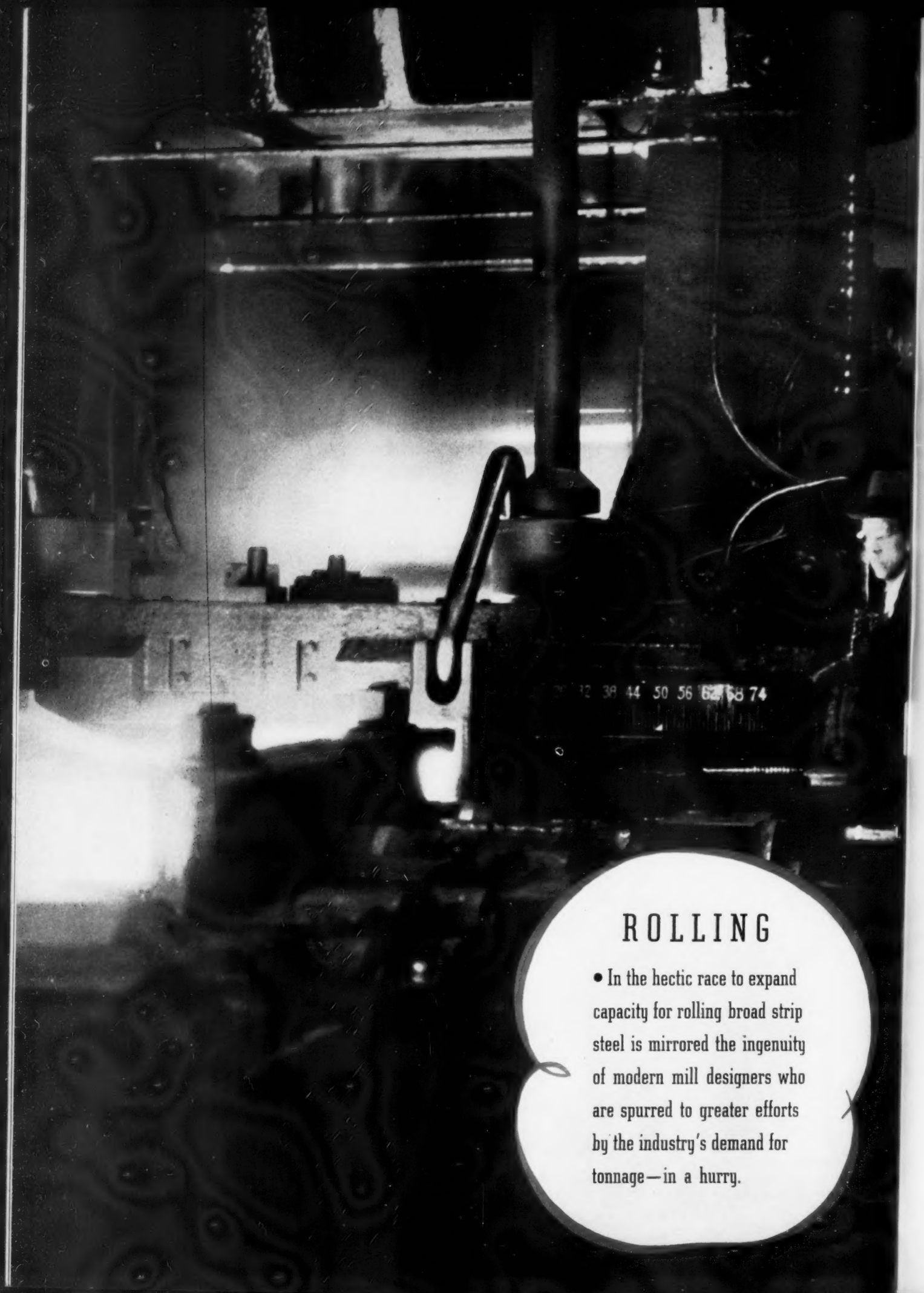

ROLLING

• In the hectic race to expand capacity for rolling broad strip steel is mirrored the ingenuity of modern mill designers who are spurred to greater efforts by the industry's demand for tonnage—in a hurry.

Strip Rolling Speeds Increased

Closer Control of Mill Operation Reflected by Wider Use of Electrical Instruments

PERHAPS the most outstanding impression obtained from even a casual inspection of a 1935 or 1936 model hot strip mill is that steel plant equipment and practices have improved tremendously in the last few years, states R. H. Wright, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in commenting on the 1935 engineering developments in the steel industry. From the heating furnaces with their array of gleaming instruments and combustion control equipment to the coilers and runout tables, the latest developments of modern engineering are in evidence at every step. Mechanical and electrical devices which, a few years ago, were classed as luxuries or gadgets now are accepted as essential equipment. In building to meet the demand for quality of product, the steelmaker overlooks no device which will provide closer control of every operation.

A simple electrical device used to transmit signals between the inspection beds and the roller's station is cited by Mr. Wright to illustrate the close supervision exercised over mill operation. This device permits the inspectors to signal the roller to change the thickness of the strip, the width or the length cut by the flying shear, or to indicate an unsatisfactory condition of either surface of the steel.

CUMULATIVE results of 30 years of co-ordinated mechanical and electrical development make the modern strip mill possible. During 1935, electrical equipment for a number of hot strip mills was ordered or placed in operation. Equipment for two 79-inch mills and one 80-inch mill still was under construction or was being erected at the end of the year.

One 79, one 56, and one 42-inch mill went into operation during the year, he states. Of the six hot mills involved in the 1935 program, the 80-inch mill has the greatest power. The total connected main motor capacity for this mill is 41,500 horsepower. Of the same six mills, the 42-inch mill has the highest delivery speed:—2000 feet per minute maximum. In both instances, new records are established.

The 1935 construction program Mr. Wright advises included approximately 25 cold roll strip, sheet and tin plate reduction mills of various sizes and types; reflecting an unprecedented activity in this field. In addition, a number of tempering mills were under construction and several reduction mills were rebuilt or rearranged to secure greater production.

A 60-inch reversing cold mill will have a 4000 horsepower motor drive for the working rolls and two 1500 horsepower reel motors; making it the most powerful mill of its type, regardless of size. A 42-inch 5-stand tandem mill, recently ordered by the same producer in the Chicago district, will have the greatest power yet applied to a tandem cold roll mill. This mill will be driven by a 500 horsepower and four 1250 horsepower main motors and a 250 horsepower reel motor.

Served by Two Reels

Among the unusual special installations is the 28-inch single stand nonreversing mill designed to roll either aluminum foil or tin plate. This mill, he states, has two reels on the delivery side; one a light reel with a small motor for aluminum and the other a heavier reel with larger motor for steel. The most unusual feature of this installation is that the original aluminum strip is formed and rolled in a special mill direct from molten metal. Another unusual installation consists of two small reversing ring type mills for flat wire and special narrow strip. These mills each have a 125-horsepower main motor and two 20/25 horsepower reel motors.

The individual alternating-current motor drives for runout tables and coilers have become an important part of the modern hot strip mill in Mr. Wright's opinion. Three strip mills placed in operation or under construction during 1935, he points out, require a total of 2100 such motors supplied with power through 20 variable frequency motor generators. Approximately 1200 motors will be equipped with WK-16 switches which serve as disconnecting devices and automatically disconnect a motor in case of a jam.

To secure the utmost advantage from the improvements in rolling processes, steelmakers are utilizing heat treating equipment of the latest type. A steelmaker in Detroit has purchased 12 annealing furnaces and 36 bases and metal hoods to be used in connection with a new strip mill. Each furnace is rated at 230 kilowatts and all units are designed to anneal two 16,000-pound coils of strip 52 inches outside diameter, 30 inches inside diameter and 48 inches wide. In the same plant, a continuous electric normalizing furnace for cold rolled strip was placed in operation. This furnace has a capacity of 5 tons per hour of 19 to 29 gage cold rolled strip 48 inches wide. The normalizing, Mr. Wright states in conclusion, is done without affecting the finish on the steel.

IN THE steel industry as in other industries men, materials and machinery constitute three important factors, observes W. H. Burr, superintendent of electrical and mechanical departments, Lukens Steel Co., Coatesville, Pa. Recent development of machinery and materials, he points out, has effected a degree of perfection which to our forefathers would have seemed impossible. As a result we now have mass production and enjoy a standard of living known in no other country in the world.

Today the greatest burden carried by industry is imposed by man, the third factor with which we have to deal. The increase in efficiency, which can be accomplished by proper selection of employes, correct employe's training and real plant representation should be the main objective of the future. This problem, if handled with the same degree of intelligence as has been used in the development of materials and machinery, Mr. Burr contends, will produce far more satisfactory results. Recently there has been developed a realization of this fact and some progress has been made.

The continued activity in the production of sheet and strip has been most noticeable during the past year. One cannot help but be impressed with the amazing increase in capacity of main drives used on new strip mills recently installed and those now being designed.

The use of reversing hot strip mills with fuel-fired furnaces both in front and back of the main stand in which are rotating strip reels may make possible rolling of longer coils of hot strip with decreased investment, thus lending itself to greater flexibility of operation in direct contrast to mass production on continuous strip mills.

Mr. Burr points out that the flat

(*Please turn to Page* 337)

Open-Hearth Insulation Advances

Steelmaking Costs Lowered by Application of New Devices; Details of Practice Studied

DURING the past year so many new devices have been placed in operation in the open-hearth that it is difficult to choose any one outstanding development. In commenting on some of the most important developments, W. J. Reagan, Edgewater Steel Co., Oakmont, Pa., includes the use of copper molds and stools in the steel industry, new types and methods of furnace insulation, new devices for control of furnace atmosphere and roof temperature, new types of furnace design and a continued and absorbing interest in grain size control and slag control.

Improves Mold Life

Use of copper molds and stools while still in the experimental stage, seems here to stay with definite increases in mold and stool life and more than likely an improvement in ingot quality, states Mr. Reagan.

Furnace insulation and design have shown material progress during the past year. It does not seem as though we are obtaining maximum savings in fuel by the use of insulation, but changes in practice are necessary to reduce fuel costs and time and experience will determine the practice necessary. New and higher melting point refractories have been developed by the use of insulation. Often times, continues Mr. Reagan, when furnaces are rebuilt, furnace design is improved, stack flues are insulated and new type dampers installed with a general improvement in steel output and noticeable savings in fuel. Among the newer types of furnace construction — interesting reports are heard about a new top-fired open-hearth now in operation. Another improvement noted, is motor actuation of furnace doors which gives much better control of door operation.

Atmospheric control is becoming more generally used Mr. Reagan advises. A consistent furnace atmosphere (either pressure or vacuum) is a material advantage to the furnace operator especially in view of a growing use of low-draft furnace operation. The direct methods of atmosphere control are still a much discussed question.

Iron oxide control is still an interesting problem. A number of plants are doing considerable work with the petrographic microscope and along this line some plants have developed a visual examination of slag samples that seems to give accurate results as to the slag composition.

Temperature control in the open-hearth also shows progress. Additional installations of the Fitterer couple both here and in Europe with good reports of its value indicates that an important open-hearth problem is well on the way to being solved.

Grain size control probably has had more than its share of the limelight during the past year. Opinions still are varied as to the best methods of control and also as to the effect of various types of grain size.

The bureau of mines is increasing its activities in the investigation of steel problems. At a meeting in Pittsburgh, Dec. 10, metallurgists from a large number of companies discussed the present work of the bureau and suggested future problems to be added to the program. At this meeting some of the bureau's work on production of sponge iron was shown and also their work on the magnetic sampling of slag was discussed.

MANAGEMENT for the past 18 months has been concerned with new finishing capacities, the purchase of which has left little money available for steelmaking improvements, states W. C. Buell, Jr., Engineer, Cleveland. General betterments in many open-hearths are urgently needed, especially where large slab ingots are now being teemed and 1936 holds considerable promise in this direction.

Furnace Control Progresses

Improvements in furnace practice of the past year has been in detail only. Insulation of the furnace and its partial instrumental control are advancing along sound lines in the four progressive plants and assisting in lower costs, Mr. Buell points out. One plant in the East reports a considerable measure of success from an almost completely instrumentized operation.

Increasing demand for ingots from which strip is to be rolled has caused all concerned to give much attention to ladle, teeming, mold, stripping and soaking pit methods, with the result that yield generally has been increased and mill losses reduced and satisfactory surface secured.

During the past year, Mr. Buell advises, two new type soaking pits have been introduced. In one, a recuperating design, the ingots are placed around a central hole through which the combustion gases pass upward and horizontally around the ingots. The other is a cylindrical chamber tangentially fired without regenerator or recuperator, and entirely independent upon insulating methods for its economy.

Installs Third Unit

In conclusion Mr. Buell cites the interest of one operator in the possibility of successfully firing an open-hearth through its roofs. The third experimental unit of this type to be built during the past few years was installed last summer at an eastern plant. It is a 5 or 6 ton furnace with a recuperator instead of the conventional regenerative system.

Use of insulation in open-hearth furnaces has shown the need of better refractories, especially in open hearth roofs, according to K. C. McCutcheon, assistant general superintendent, Ashland division, American Rolling Mill Co., Ashland, Ky. In some places, the application of insulation has been made with no difficulties; in other, trouble has been experienced in the roof and frontwalls. This has been attributed, he explains, to improper design of the furnaces, but better refractories at the danger point may serve the purpose.

The saving derived from tapping larger heats is well understood. Where this practice is followed it means prolonged charging and often filling the furnace with scrap. This and the use of lighter scrap, has changed the service requirements on brick for front and backwalls and indicated the necessity for improved materials or changed the design or both.

All the general interest in open-hearth practice, points out L. C. Hewitt, director of research, Laclede-Christy Clay Products Co., St. Louis, is the further improvement in fire clay nozzles. The advance lies in increase refractoriness without

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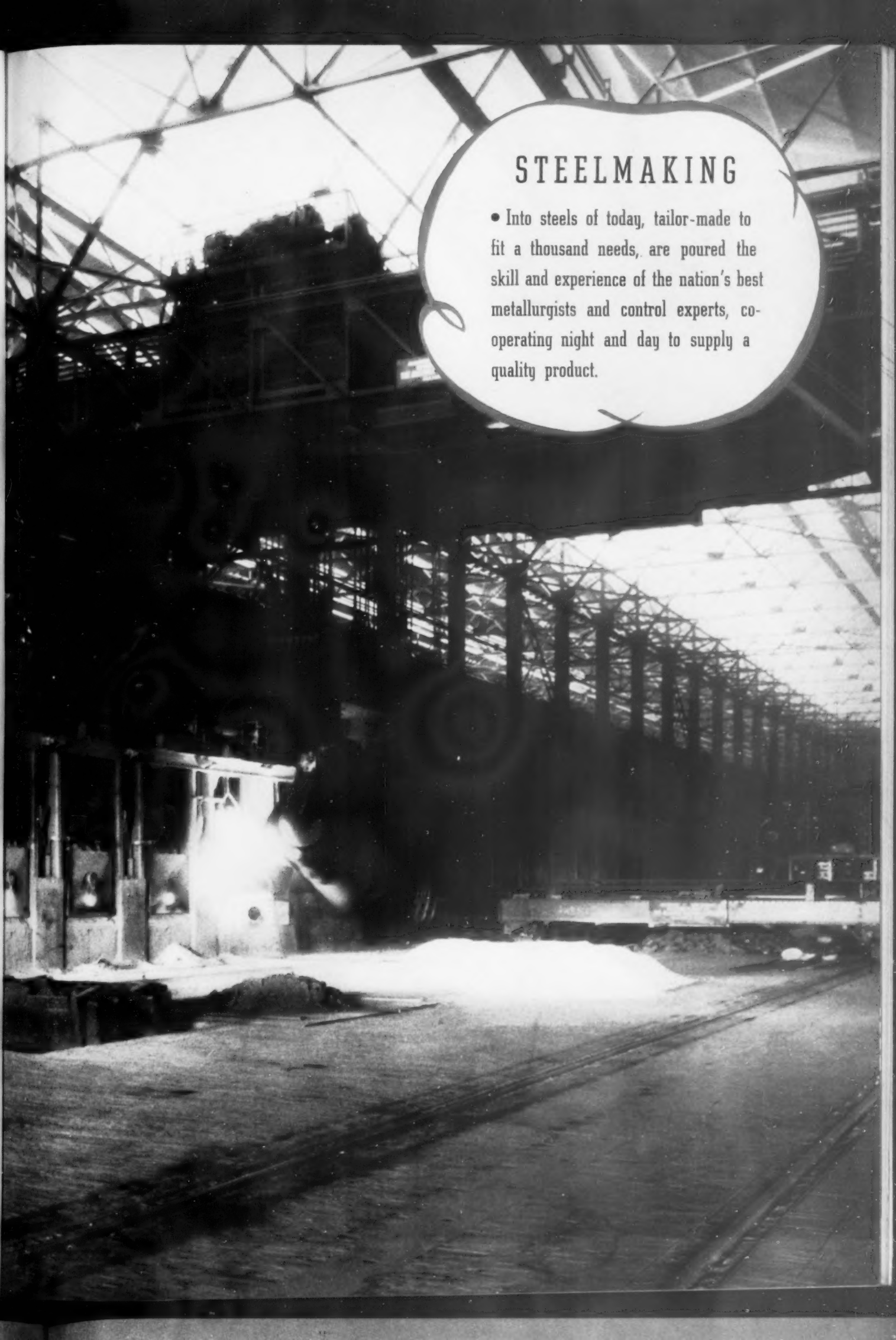

STEELMAKING

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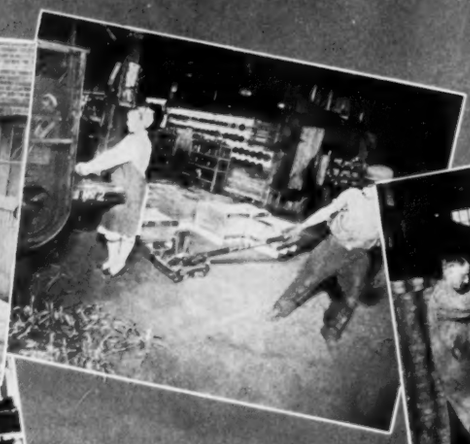

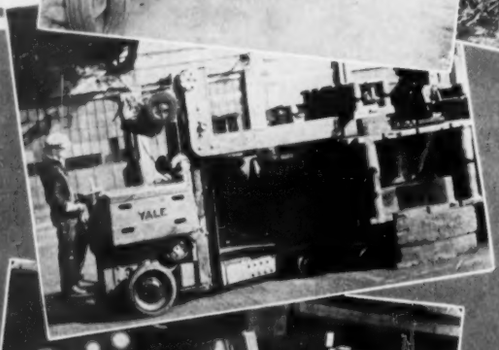

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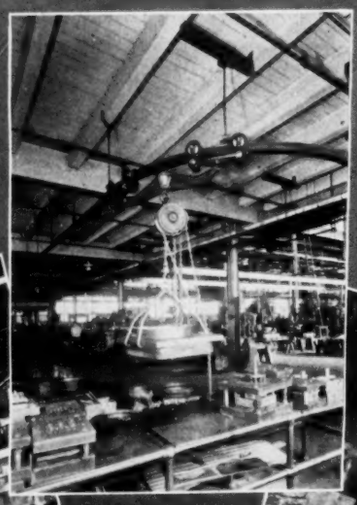

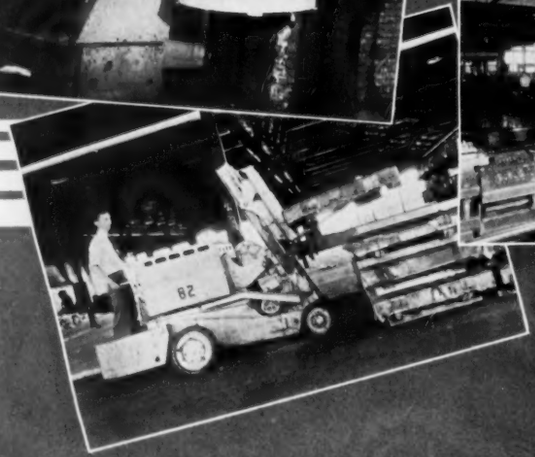

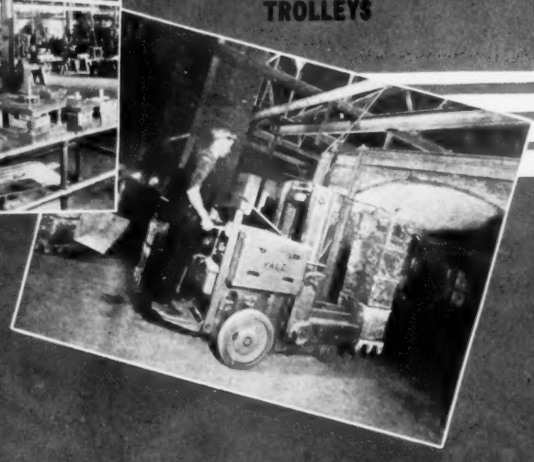

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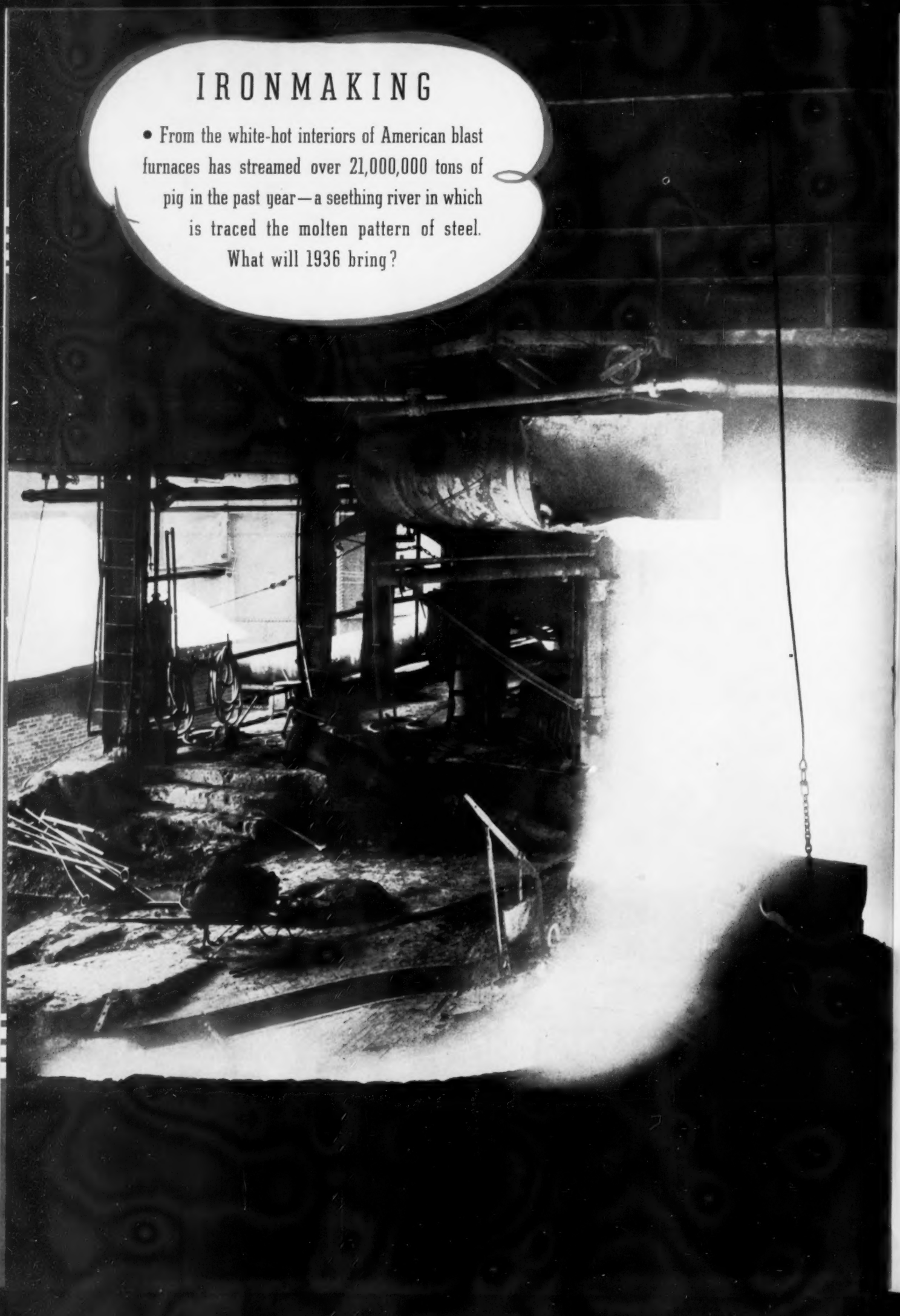

IRONMAKING
• From the white-hot interiors of American blast furnaces has streamed over 21,000,000 tons of pig in the past year—a seething river in which is traced the molten pattern of steel. What will 1936 bring?

Blast Furnace Improvements Needed

Installation of Many Types of Subsidiary Equipment Awaits Appropriation of Funds

SO FAR as attention from parent managements is concerned, blast furnaces continue to be the step children of the industry. Those lusty infants, the continuous mills, continue to get practically all the capital investment plums. Meanwhile, observes W. A. Haven, vice president, Arthur G. McKee & Co., Cleveland, furnace superintendents prepare and revise appropriation requests for badly needed replacements and for improvements that will enable them to keep production costs down to the remarkably low figures accomplished by slow blowing and other depression emergency measures.

As the furnaces are again speeded up, he points out, the old deficiencies in equipment again begin to be felt, and also the need for some changes in practice or designs that will keep coke consumption and losses down to the low figures recently obtained.

Flue Dust a Problem

Clean gas and small checkered stoves, in his opinion, will take care of the additional hot blast requirements but keeping down flue dust at high rates of blowing presents some problems that are as yet not entirely solved. Theoretically, big tops should do the trick, but they have not lived up to expectations. Bigger tops have brought with them some new problems in distribution of stock under the bells. These have grown to such large diameters that difficulty is being experienced in getting enough fine material back into the central part of the furnace. As a consequence, he warns, the chimney effect may get too pronounced from segregation of lumpy ore and big coke in the central portion.

But furnacemen may look forward confidently to a solution of this problem and with it a more complete realization of the benefits that should accrue from the larger furnace volume and decreased gas velocities that the big tops have made possible.

In other directions, charging devices, gas cleaning and handling, stoves, flue dust recovery, mud guns, ladles, blowing engines and many improved types of equipment have been developed during the past few years which await only the availability of funds for application. Mr. Haven directs attention to the fact that they constitute a valuable reserve of money-saving possibilities.

During 1935 the new McKee valve has been installed in hot dirty gas service and in ten months continuous service has further demonstrated that the troublesome problem of valving blast furnace gas finally has been solved in a satisfactory manner.

Another innovation introduced during the year has been a new McKee type large bell rig which makes it feasible to remove the big bell counterweights from the top of the furnace and to eliminate the big bell beam entirely. By this means a considerable amount of weight is taken off the top structure and the danger of damage from gas kicks between the bells greatly reduced. With this rig the bell is centered and adjusted more easily. A smaller bell hoist can be used with this rig than was needed for the old type.

Other initial installations during the year include the combined primary and final gas units in which an electrical precititator is superimposed on a McKee-Feld scrubber. Also an improvement in design of the nested tile checker for hot blast stoves which provides lateral passages between flues, for the more equal distribution of gas or air throughout the checkerwork.

IN THE paper entitled "Modern Blast Furnace Theory and Practice" written by S. P. Kinney and myself for the World Engineering Congress in Tokio in 1929, states R. H. Sweetser, Consultant in Blast Furnace Practice, New York, it was pointed out that the remarkable advance in blast furnace practice in the past ten years in the United States has been made without any great change in design and without any great invention in equipment or in accessories. In a paper entitled "Notes on the Development of the Iron Blast Furnace" by A. J. Boynton and S. P. Kinney, mention was made of "static condition with regard to blast-furnace design, which is likely to last from some time to come."

Thus, for the past 16 years, Mr. Sweetser contends, there has been no improvement on the metallurgical apparatus called the "iron blast furnace" that so successfully makes use of "old man gravity" and the heat exchange between the upward flow of hot gases and the downward flow of the cold solids. No new blast furnaces have been added in this country since 1928, but many have been dismantled.

In the January 7, 1935 issue of STEEL, Mr. Sweetser pointed out that the next excess baggage in blast furnace practice to be eliminated was a part of the several tons of air-blast used per ton of pig iron. Although nothing practical was done in this direction in the United States last year, he advises, the problem received considerable attention, and now is being investigated seriously. There can be no reduction in the weight of oxygen required per pound of carbon burned, he contended, but there can be much less atmospheric nitrogen used in the air-blast without impairing the volume of gas needed for conveying heat from the hearth to the decending column of solid materials in the shaft of the furnace. This likely is to be a major research problem in 1936.

The prime product of the iron blast furnace,—the pig iron itself,—received research attention in 1935 and much was learned about this supposedly rough material,—perhaps enough to put "good" pig iron into the class of alloys of iron. It is now recognized that there is a sharp distinction between pig iron in its molten state ("hot metal") and pig iron in its solid state ("iron in pigs"), other than the difference between a liquid and a solid. The Technique of "cold pig" (the solid state of "hot metal") differs from that of merchant pig iron which is marketed in its solid condition, whereas hot metal is delivered at its destination and used while it is still liquid.. Much research work as to the physical and chemical characteristics of pig iron, Mr. Sweetser states in conclusion, is being carried on.

BLAST furnace linings on which 1,000,000 tons of iron were produced on one campaign are considered as giving exceedingly good life, states Jay J. Seaver, vice president, H. A. Brassert & Co., Chicago; but during the year just closed, he continues, certain blast furnace operations have attained production of nearly 2,000,000 tons on one lining, and in some cases auxiliary equipment has had to be improved to keep pace with the life of the linings.

In general, however, blast furnace units of the steel producing plants have not received as much attention from the standpoint of improvements in the past few years as have the finishing departments of these mills. Because of the highly competitive auto-

(*Please turn to Page* 338)

Modernization Brings Profits

Companies Which Fail to Keep Abreast of Modern Practice Are Doomed to Failure

INDUSTRIAL companies which fail to take advantage of modern manufacturing equipment and methods are doomed to eventual financial failure. This is the consensus of opinion of 41 executives of important machinery and equipment manufacturing organizations, as expressed in articles which appeared in STEEL during a large portion of the year under the title, *Forum on Modernization*. Short and significant excerpts from these discussions follow.

Recently the time of machining a clutch housing and gear has been cut from 124 to 38 minutes each. The cost per piece has been reduced from $3.10 to $0.95. Total savings per year in production of this piece, based on an 8-hour day, are $6801.20. This means a net profit of 122 per cent annually on the fully equipped turret lathe, costing $4775, which makes this economical production possible—*Charles J. Stilwell, vice president, Warner & Swasey Co., Cleveland.*

Recently a large manufacturer of automobile accessories replaced 39 automatic screw machines built 10 to 12 years ago with 16 new machines of the latest type. The 16 new machines are doing the work formerly done by 39 machines which, in effect, means a production increase of more than 100 per cent per machine.—*Tell Berna, general sales manager, National Acme Co., Cleveland.*

Many customers lately have been selling or scrapping used machines which are far from being worn out and which continue capable of turning out work of average quality in large volume. The reason is that the new machines which replace them will produce more accurate work.—*Henry Buker, vice president, Brown & Sharpe Mfg. Co., Providence, R. I.*

Never before has it been possible to invest money in new machine tools with greater safety and assurance of high returns than at the present time. —*Howard W. Dunbar, general manager, grinding machine division, Norton Co., Worcester, Mass.*

Innumerable cases have come to our attention which prove that cost reduction and quality improvements have resulted directly from the installation of new and improved machines.—*W. W. Tangeman, vice president, Cincinnati Milling Machine Co. and Cincinnati Grinders Inc., Cincinnati.*

The buyer today can be sure he is getting the latest and highest development—a machine which is unlikely to be radically improved for some time. —*August H. Tuechter, president, Cincinnati Bickford Tool Co., Cincinnati.*

A machine tool, after it is installed, is depreciated year after year. The manufacturer who does not replace equipment regularly in an endeavor to equal the depreciated value is headed for a rude awakening.—*C. N. Kirkpatrick, secretary and sales manager, Landis Machine Co., Waynesboro, Pa.*

Tool builders are confronted with selling their product to customers who demand that machines pay for themselves in one and two years—earnings of 100 and 50 per cent, respectively, on their investment. At the same time, these companies are satisfied to invest their surplus funds in government bonds paying 2½ to 3 per cent. It is needless to say good machines tool equipment will earn a much greater dividend than any other investment a manufacturer can make.—*H. C. Pierle, secretary and sales manager, R. K. LeBlond Machine Tool Co., Cincinnati.*

To buy or not to buy? If you want to share in the recovery, you must. If you are in a bad competitive situation, you should. If you hope for profits, or more profits, you can. If you want a good return on investment, you will. Everyone who can, must; for those who do will get the larger share of the improvement in business.—*Harry S. Robinson, secretary, Cincinnati Shaper Co., Cincinnati.*

Electric refrigerators and many other highly developed products could not be built to sell at today's prices were it not for the accuracy made possible by new tools.—*Roger N. Heald, president, Heald Machine Co., Worcester, Mass.*

Real progress requires better products at lower costs. The major equipment manufacturers have intensified their efforts to advance the contribu tion their equipment can make to this goal.—*Frank H. Adams, general manager, Surface Combustion Corp., Toledo, O.*

There has been such a large number of improvements made in metalworking machinery in the past several years that it behooves management to keep informed as to the profit making possibilities of new and replacement equipment.—*W. D. Creider, general manager, Oilgear Co., Milwaukee.*

Every hour an obsolete arc welder is operated it wastes at least 30 per cent of the operator's time, 14 per cent of the electrodes used and 10 per cent of the power consumed.—*J. F. Lincoln, president, Lincoln Electric Co., Cleveland.*

Let any representative metalworking establishment refrain long enough from buying machine tools of the latest design and that establishment will first cease to be progressive, next cease to be even representative, eventually cease to exist.—*Hugo L. Olson, president, Sundstrand Machine Tool Co., Rockford, Ill.*

In the past few years, particularly in the last three years, greater advance has been made in the refinement of drop forge production equipment than in the several preceding decades. —*Eugene C. Clarke, president, Chambersburg Engineering Co., Chambersburg, Pa.*

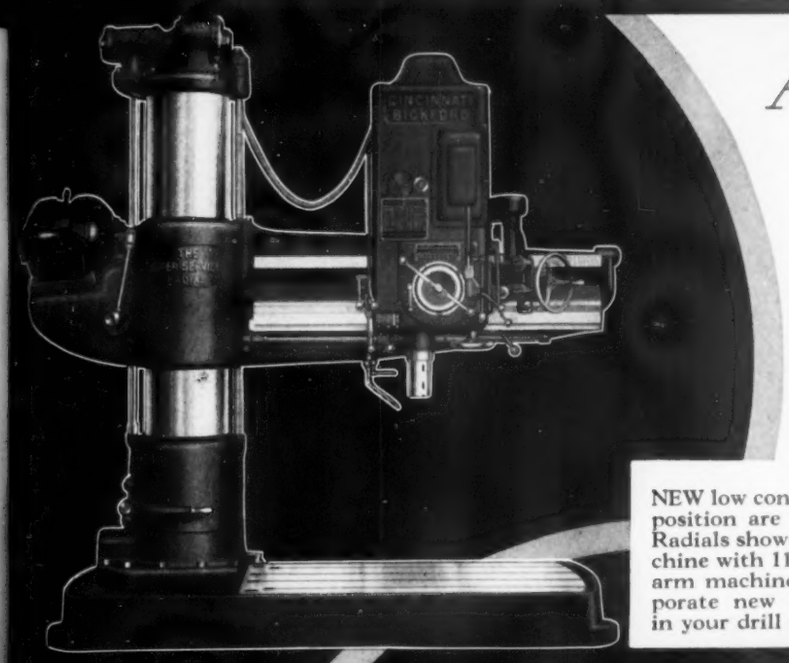
The most welcome visitor we have at our plant is the sales engineer who says, "With your permission I would like to make an analysis of such-and-such manufacturing operations in your shop, to see whether or not our improved machines and methods will save you money."—*W. E. Whipp, president, Monarch Machine Tool Co., Sidney, O.*

The plant which will continue to lead the way to lower production costs in the heavy industries is that one which has learned to look to material handling methods for a large portion of operating profits.—*Walter Harnischfeger, president, Harnischfeger Corp., Milwaukee.*

Whether it is advisable, from an economic standpoint, to replace old machines depends on three major factors: Will the new machine tool work faster than the old one? Will it produce better work? Will it reduce setup time, tool-setting time and idle time?—*August Marx, vice president, G. A. Gray Co., Cincinnati.*

When business finally rounds that

(*Please turn to Page* 339)



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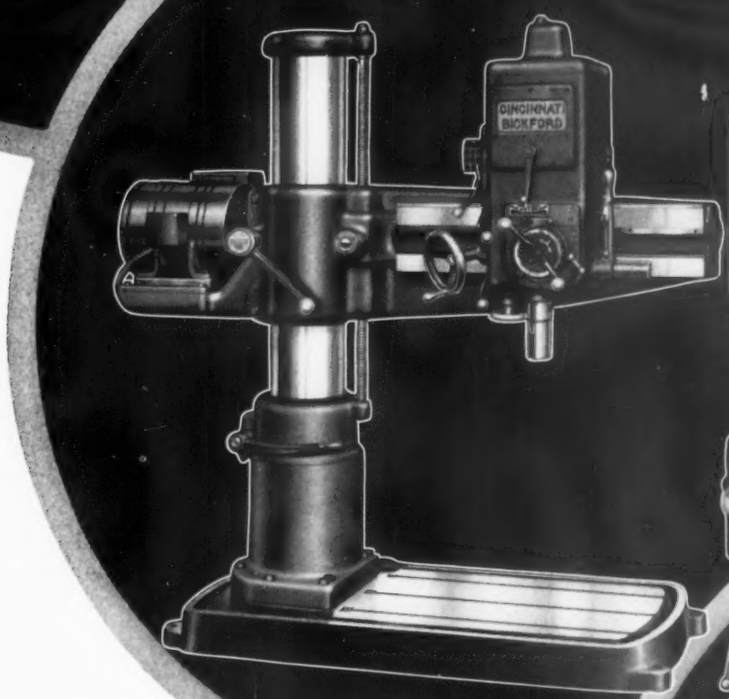
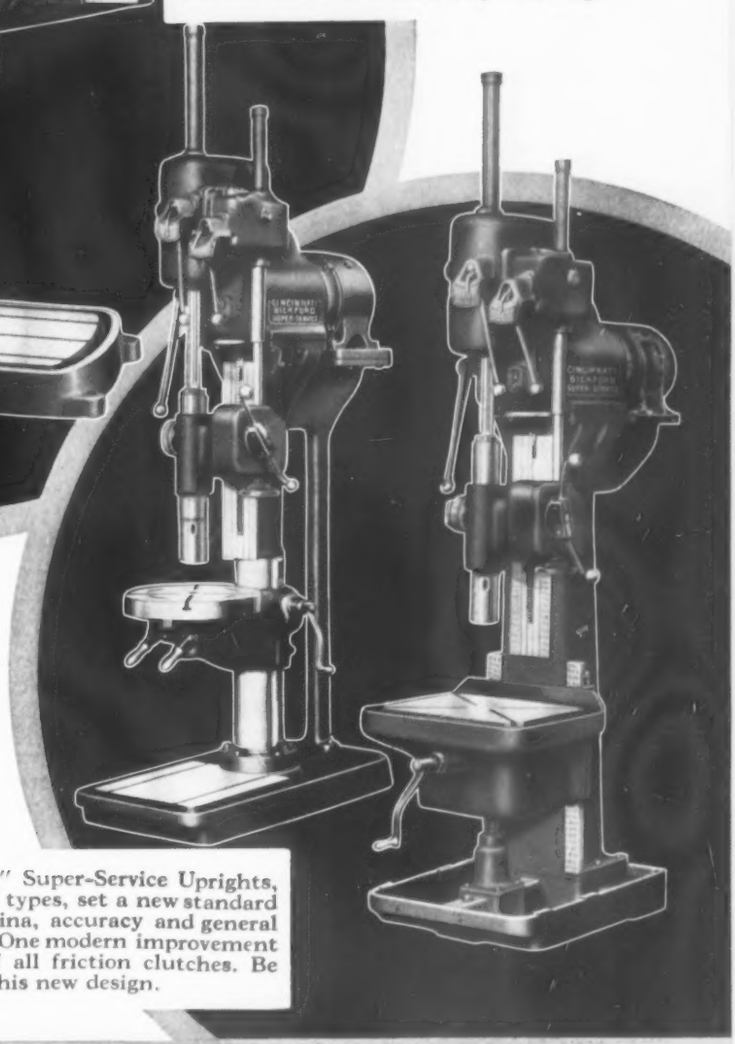
NEW low controls centralized 100% at the operating position are featured on the line of Super-Service Radials shown at the left. All sizes, from the 3′ machine with 11″ diameter column to the powerful 12′ arm machine having 26″ diameter column, incorporate new improvements that will save money in your drill department.



NEW High Speed 3′ and 4′ Super-Service Radials will provide a speed range to suit your work no matter how small your drilling. All speeds and feeds changed by sliding gears with single lever control at the head. Balanced head and arm move on antifriction bearings for the ultimate in fast, easy handling.



The most important machines in your shop include your radial and upright drills. New savings are possible with the recent Cincinnati Bickford developments. Features to give you "more holes per dollar" should be working for you now. Write for our latest catalogs.

NEW 21″, 24″ and 28″ Super-Service Uprights, round and box column types, set a new standard for convenience, stamina, accuracy and general production efficiency. One modern improvement is the elimination of all friction clutches. Be sure to get details of this new design.

The Cincinnati Bickford Tool Company

Oakley, Cincinnati, Ohio, U. S. A.

Aerial view of a Lake Superior open pit iron ore mine. The Mesabi Chief is owned jointly by National Steel Corp., American Rolling Mill Co., and Wheeling Steel Corp., and operated by Hanna Ore Mining Co. The area of the mine is about "two forties," or 80 acres. Eventually the two forties at the right of this pit will be stripped and mined

Prosperity Returning to Lake Superior Ore Industry

SIGNS of returning prosperity for the Lake Superior iron ore industry multiplied in 1935. Shipments increased. Consumption outran shipments. Mine stocks were reduced, and supplies at lower lake ports and furnaces were cut below normal.

This combination, with rising demand, puts the industry in the most favorable position since 1929. Producers appear confident of further substantial gains. Because of low stocks, if steelworks operations show the expected rise, an early and strong movement of iron ore is almost certain to result this year.

In 1935 the mines forwarded 28,362,368 tons by vessel, 27.4 per cent more than in 1934. This was the third consecutive yearly increase. The total was nearly midway between the 3,589,000 tons in 1932—the low point in the depression—and 66,166,000 in 1929, the all-time peak.

Since 1930, covering the depression, the industry has been moving ore at an annual average rate of 19,800,000 tons, or 35 per cent of the 56,100,000 tons average in the preceding five years, the country's most prosperous period. To find a lower consecutive five-year average figure than this 19,800,000 tons, the industry must go back in its records to 1894-1898.

As an offset against the punishment the industry took from the depression, as indicated by output, there is only the comfort that the life of merchantable reserves has been extended about five years. Some of the steel interests have been wondering whether iron ore is a liability or an asset, though they have been getting rid of their poor properties and acquiring good ones.

Consumption of Lake Superior ore, approximately 30,500,000 tons, was 9 per cent more than shipments. Except in 1932, when the mines were practically shut down, 1935 was the first year since 1927 when the amount of ore used exceeded the new tonnages.

Stocks Reduced 3,300,000 Tons

Stocks on hand at lower lake ports and furnaces Jan. 1, 1936, totaled about 31,000,000 tons. This was the smallest for this date in more than 17 years. It is 18 per cent less than the average of 36,800,000 tons for the preceding 17 years. At the outset of 1935 the stocks amounted to 34,373,000 tons.

Steelworks operations at about 50 per cent for four months will reduce these stocks to 19,000,000 tons by May 1, or 17 per cent less than the average for the preceding 17 years.

Ore consumption increased and stocks decreased despite the diminished ratio of ore to iron and steel production. While 1.53 tons of iron ore was used for every ton of iron and steel made in 1913 the ratio showed a steady decrease to 0.84 to one in 1932. In 1933 it rose to 0.86, in 1934 to 0.92, and the final figures for 1935 are expected to show another slight gain. Iron and steel production is obtained by adding the output of pig iron, other than basic and bessemer, to steel ingots and castings.

One reason for the apparent change in the trend during these past three years is the growing insistence of some consumers for steel made without the use of scrap, or a minimum of scrap. Both merchant blast furnaces and the steelworks have felt this demand, and generally ascribe it to increasing use of alloy steels, scrap from which contaminates the new product, and makes it undesirable for certain purposes.

Ore was produced last year from approximately 125 mines, the number varying little from those active at some time during the season in each of the preceding two years. In 1932 only 57 reported some shipments, and probably less saw actual work in new production. By doubling the active mines last year, output was raised nine times that over 1932.

In 1929, year of heaviest shipments, only 161 mines were operated. The largest number ever to operate was 261 in 1918, when production totaled 62,800,000 tons.

The number of active mines has come to have little meaning as a gage of a year's operations. For the past several years the industry has shifted its operations from one mine or group to another, in order to provide work. This procedure has raised costs, although open-market prices have remained unchanged for seven years.

One benefit resulted, however, when labor organizations repeatedly made determined drives to enroll the miners, and failed. They failed even after they had enlisted the sympathies of federal mediators, who stepped in at the organizers' requests—only to find the men at work, and nothing to mediate. The men have wanted work, not organiz-

ation, and the prospects are better for more work this winter and the coming summer than in any year since 1930.

An outstanding development in the year was Republic Steel Corp.'s acquisition of the Corrigan, McKinney Steel Co.'s mines, with other Corrigan-McKinney properties. It was part of Republic's testimony in the merger suit that Republic obtained about 50,000,000 tons of ore reserves through Corrigan-McKinney to round out its own reserves of 122,000,000 tons.

This raised Republic to a more important position among the holders of Lake Superior iron ore, although of its own 122,000,000 tons reserves only about 50,000,000 tons generally are believed to be located in the Lake Superior district. While Republic ranks third in steel ingot capacity, it evidently does not come up to that position in lake ore reserves.

There is no other subject concerning which steel companies are so "touchy," as the amount of their reserves. One reason is to be found in the fact that "reserves" is an indefinite term; it may mean good, merchantable ore, or again it may mean some of such ore, plus other material which is not merchantable as mined.

Ten Leaders in Ore Reserves

From the tax records, and their own experts' studies, the steel companies, however, have a fairly reliable line on how they rank in the matter of reserves of ore, merchantable, or easily made merchantable by present practical methods.

First in this list is the United States Steel Corp., credited with about 55 per cent of all such ore, roughly 700,000,000 to 800,000,000 tons. Its ingot capacity represents 45 per cent of the industry's total.

While unanimous agreement on the question of reserves manifestly would be impossible, one important steel interest—which ought to know—places the list of possessors in the following order: United States Steel, National Steel Corp., Youngstown Sheet & Tube Co., Cleveland-Cliffs Iron Co., Jones & Laughlin Steel Corp., Bethlehem Steel Corp., Republic Steel Corp., including Corrigan-McKinney; Interlake Iron Corp., and Inland Steel Co.

In ingot capacity the nine leaders are: United States Steel, Bethlehem, Republic, Jones & Laughlin, Youngstown, National, American Rolling Mill Co., Inland, and Wheeling Steel Corp.

National is second in ore reserves, but sixth in ingot capacity. Bethlehem is second in ingot capacity, but only sixth in lake ore reserves. Bethlehem, as well known, has large reserves in South America. Furthermore, it could draw heavily on other sources than its own in the lake district. With Youngstown and Interlake's reserves it would undoubtedly be second in the list. It now own half of the Mahoning mine, one of the largest properties in the district.

Mining companies received little relief from high taxes in 1935. Although they won their suit for a reduction in assessments in the Minnesota circuit court late in 1934, the state appealed to the supreme court, where the question still rests. The state did not change valuations—1935 being an off year—but it slapped on the highest levy in its history. Occupation taxes were relatively light owing to the slow rate of operations. The total tax bill for the Minnesota mining companies for 1935 probably will be slightly lower than in recent years.

In Michigan the tax situation was made easier when total valuation for mines and reserves for 1935 was fixed at $62,370,000, a reduction of $3,083,000 from 1934.

Steel Wage Rates Steady; Employment Increased

LABOR in the steel industry benefitted from increased employment in 1935, although hourly wage rates were unchanged.

Since the beginning of the depression steel labor has taken two reductions in hourly rates, and has received two increases, these cancelling the reductions and restoring the rates to the 1929 high.

The rate for common labor held unchanged at 44 cents an hour from August, 1923, to Oct. 1, 1931, when there was a 10 per cent reduction. In May, 1932, at the bottom of the depression, there was another cut of 15 per cent, to 33.7 cents an hour. This continued in effect until the code rate was adopted which generally provided for 40 cents an hour, or an advance of 18.7 per cent.

Common Labor Wage Rates in Steel Industry

	Wages for 10 hrs.	Per cent advance	Per cent advance over 1915
1915	$2.00	....	....
Feb. 1, 1916	2.20	10	10
May 1, 1916	2.50	13.6	25
Dec. 15, 1916	2.75	10	37.5
May 1, 1917	3.00	9	50
Oct. 1, 1917	3.30	10	65
April 16, 1918	3.80	15	90
Aug. 1, 1918	4.20	10.5	110
†Oct. 1, 1918	4.62	10	131
‡Feb. 1 1920	5.06	10	153
†May 16, 1921	4.05	*20	102 5
July 16, 1921	3.70	*8 6	85
Aug. 29, 1921	3.00	*18.9	50
Sept. 1, 1922	3.60	20	80
April 16, 1923	4.00	11	100
††Aug., 1923	4.40	10	120
Oct. 1, 1931	3.96	*10	98
May 16, 1932	3.37	*15	68.5
Aug. 19, 1933 (Code)	4.00	18.7	100
April 1, 1934	4.40	10	120
(No change since)			

*Reduction.

†Basic 8-hour day in effect; time and one-half for overtime.

††Twelve-hour day abolished. Labor placed on 8-hour shift paid at rate of 50 cents an hour.

The rates prior to Oct. 1 were those announced from time to time by the United States Steel Corp.

In April, 1934, the industry made a voluntary increase of 10 per cent, to 44 cents. The actual rate had little significance as to the number of hours worked, the problem of employers and employes alike being how to provide, or how to obtain, work, in contrast with former years when efforts were made to reduce the number of hours worked.

The average number of hours worked per week in October, when steelworks were operating at 52 per cent, which was close to the average for the year, was 36.8, compared with 25.4 in October, 1934. Carrying out the comparison between these two periods, the average hourly earnings were 65.4 cents, against 64 cents in 1934. The number of employes on the steel industry's payroll was raised to 436,554 from 381,431, and the amount of the payroll was increased to $51,456,368 for the month, from $32,723,909.

Labor Relations Peaceful

Employe representative groups of several of the steel companies late in the year petitioned for wage increases of 10 per cent or more, but these were held in abeyance, pending further improvement in steelworks operations.

The year was notable for the generally peaceful relations which existed between employers and employes. The industry was affected more by strikes and disturbances in some of the leading steel consuming industries, and while these were threatening in the first half of the year the labor skies cleared considerably in the last half.

Some significance was attached to the withdrawal of John L. Lewis, president of the United Mine Workers of America, from active partici-

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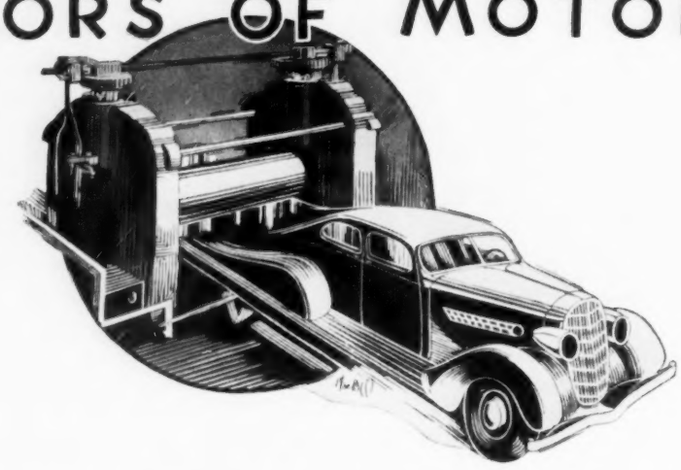
MIRRORS OF MOTORDOM



DETROIT

DETROIT was first in professional baseball, first in professional football, first in pugilism in 1935—and then, there was the motor car industry. It made a fourth "first" for the city, emerging as it did in such rapid fashion from the depression.

This New Year Eve, Detroit had a few toasts to drink: To the Tigers in baseball, to the Lions in football, to Joe Louis, and an extra one for the motor industry.

The motor industry was not only 44 per cent ahead of 1934 in production, but it also was up to a level fractionally better than 1930. So, that means that 1935 in this industry was the best since 1929. No other basic industry can touch that 1935 showing.

Styled with Steel

But while credit is being passed around, steel should come in for its plaudits. For the motor industry in styling a product that so captured the public's fancy last year did so through the co-operation of its material suppliers, steel of course being preponderantly the most important.

Only through the availability of even wider sheets than in 1934 and through better drawing and forming steels were the long sweeping curves of 1935 bodies and fenders made possible.

Steel used in the 1935 automobile shared to a slightly greater extent in the car's total weight. The trend was to slightly longer wheelbases and moderately heavier total weight. Steel in the top and body continued to crowd out wood and composite materials. The 1935 trend was noticeable toward pressed steel wheels, a substitution of flat-rolled steel for wire, but in the final analysis more tonnage resulted.

To generalize, and at the same time be candid about it, the automobile industry got away with a lot in 1935 without paying the usual proportionate expense. In other words, what it did was to steer clear of the pitfalls of major mechanical changes and therefore the heavier expense.

By changing a curve here and there, swinging over to a new type radiator grille, dolling up the instrument panel, and keeping away from basic motor changes, the 1935 motor car was ostensibly a big change over its 1934 counterpart, but basically not.

The year closed saw nothing like the first steel tops widely spreading to favor, or knee action being worked out—those were 1934's major contribution. But to the credit of 1935 must go the swingover to hydraulic brakes, the change to die castings for radiator grilles, and the trend toward easier steering and higher motor compressions.

Aside from the usual run of plant facility improvements, which in motordom are more or less going on continually, a number of major expansion programs were worked out in 1935. Most of these were instituted not from the basic policy of changing the motor car itself, but from motives of rectifying manufacturing obsolescence or, another basic factor, to strengthen a competitive hold.

Millions for Improvements

The outstanding example of the former was Ford's large coke oven expansion, and of the latter, Chevrolet's moves to build up assembly plants strategically over the country.

Ford spent upward of $25,000,000 building a new 62-battery coke oven at Rouge, a new power plant, and completed the continuous strip steel mill begun in 1934.

General Motors enlarged on its policy of plant decentralization, and also spent many millions building assembly plants at such points as Baltimore and Indianapolis and diversifying its parts manufacture by enlarging both the Saginaw, Mich., and Muncie, Ind., divisions. General Motors added considerable storage space over 15 key points over the country.

Chrysler Corp. pursued much the same policy as General Motors in acquiring plant space at various points outside metropolitan Detroit. Practically all the motor makers and their allied parts suppliers embarked on spending programs that saw the first substantial business accruing in five years to the conveyor-system makers, the manufacturers of spray booths and of heating furnaces.

Because a 30-odd year old tradition was shattered in 1935 as regards the time of showing new cars, when it was decided to hold 1936 shows in November, retooling and new die work for the change came in September of last year, rather than November. A more liberal hold was given on the treasury strings by the automobile industry for new machinery purchases, but, depression schooled, their eyes were still peeled for used machinery bargains.

Better Riding Is Aim

Springing came in for its attention in 1935—not so much that new alloys of steel were specified, as when silicomanganese steel was pushed for coiled knee-action springs that came out in 1934, but that the subject of springing frequencies was more keenly observed and beneficial results applied.

Several cars went to a longer front leaf-spring and to a shorter rear spring in order to cut down pitching. In some models, as much as 85 per cent of the length of the car was being carried within the spring-base in 1935.

Sway stabilizers were used more widely, especially on the heavier and more expensive models and the use of kick shackles was stressed to minimize road shock. Car makers had agreed generally that this shackle should be placed at the front of the left front spring.

Power plant engineers, in believing they no longer needed additional power, were purposely limiting horse-

powers in 1935. Believing that motorists would rather save gasoline costs than a few minutes in an all-day drive, compressions were raised for economy only. In other words, "internal governing" became a policy, to step up compression but hold power unchanged and thus cut down on fuel. The carburetion problem was helped by balancing the air pressure inside the float chamber with that inside the carburetor.

Also on the subject of power plants, motor cooling was explored. Most makers went to full-length cylinder water jackets. Radiator capacities were increased as much as 25 per cent, and "air scoops" placed inside the grille and under the hood aided the cooling problem.

Aluminum Pistons Gain Ground

For the most part, motor pistons continued to be electro-hardened aluminum, but Ford went to a cast semisteel. Many makers were using cast camshafts in 1935 cars, and cast valve lifters came in. Only Ford employed a cast crankshaft; all others were of rolled steel. By changing the size of the bore and stroke, motor compressions were generally stepped up. "Calibrated-ignition" was of 1935 coinage.

Among accessories with direct bearing on the motor, the overdrive and supercharger both gained in popularity in 1935. The feature some manufacturers made was on screening the oil both before entering the pump and before re-entry into the crankcase. Steering ratios were increased in many cases.

Most car makers decided on a change from mechanical to hydraulic-type brakes in 1935. Usually the front wheel brake cylinders were manufactured larger than those in the rear. Most hydraulic systems retained a cable-brake hookup on the rear wheel. Shortened brake pedals were a 1935 improvement.

Running boards Are Disappearing

For the bodies, 1935 conceded further steps to streamlining. So-called "hog-backed" and "pontoon" fenders made their appearance, trunks were practically all built in, front fender wells were on the wane, and water caps were virtually all concealed under the hood.

Practically all bodies were slung closer to the road; in fact, in some only 10 and 11-inch clearances were left. Overall height was cut down, and width was either maintained or increased. Lower corners of many windshields were made to follow the front cowl line, many floor boards went over to steel, and running boards seemed to be on the way out. Most makers cut down on running boards in efforts to get greater body width; some dropped the board entirely and used only side buffer embellishments.

One manufacturer came out with the claim that its fenders were not attached to the frame, but along with the radiator were fixed directly onto the body.

Safety glass was made standard equipment on more cars in 1935. Radios were no longer a luxury. Another 1935 trend was toward the use of more broadcloth upholstery and interior beautification.

Gadgets Emphasize Safety

Nothing came out the past year that compared in importance with the automatic starter or the electric gear-shift control, both carryovers from 1934. Perhaps Studebaker's "hill-holder," an automatic brake for stalled cars in an upward inclined position, will lay claim to being the No. 1 gadget, but this did not come out until late in the year.

Some refinements were directed at safer driving. One was the small hot-air fan, mounted on the steering column that, directed against the windshield, was claimed to prevent ice or frost from forming. A more important contribution, however, came from the tire people who brought in the double inner-tube, minimizing blowouts.

The nonglare headlight was championed by Plymouth, which added that its device "penetrated fog." A few, like the Lincoln Zephyr, by recessing headlamps down well over the front fender crown and therefore closer to the road, ameliorated the glare problem.

Efforts were directed at car and part ventilation. Hudson came out with the air filter in the floor. A ventilator for some clutches was devised, so was an oil filter to be cleaned by a simple twist of the filter blades. Fuel filters came out with a clamping nut at the top instead of the bottom, giving three times the filtering area.

The year just passed saw the first specially-designed spark plug to check radio interference, the automatically-controlled spark advance, and a dry battery in conjunction with the ordinary wet battery for cold-weather starting.

Also, there was the midget brake tester mounted on the steering column, the wind-powered battery charger for the garage, the steering-wheel ring that made it possible to sound the horn without taking the hand off the wheel, the flexible-spoke steering wheel, and last but not least, a handy gasoline-tank syphon.

Automobile Production

Passenger Cars and Trucks—U. S. Only
By Department of Commerce

	1933	1934	1935
Jan.	128,825	155,666	292,817
Feb.	105,447	230,256	335,700
Mar.	115,272	338,434	429,834
Apr.	176,432	352,975	477,746
May	214,411	330,455	364,727
June	249,727	306,477	361,321
July	229,357	264,933	337,044
Aug.	232,855	234,811	240,051
Sept.	191,800	170,007	89,805
Oct.	134,683	131,991	275,021
Nov.	60,683	83,482	398,024
Dec.	80,565	153,624	*385,000
Year	1,920,057	2,753,111	*3,987,090

*Estimated.

Hit Peak in April

The 1935 peak in production was set in April when 477,746 passenger cars and trucks were built in the United States, though March at 429,834 units and November at 398,024 came closely behind. Second quarter output was the peak of the year.

Only a brief lull in production occurred in 1935, which was the model changeover period in September, and October output stepped up to better than the relatively high plane where August left off. There were eight months in 1935 better than 300,000-unit production; in 1934 there were but four and in 1933, none.

The big production surprise of the year was provided by the closing 45 days. It has been expected that, after dealers were stocked at show-year, production would be brisk for a time, which was early November last short time to meet actual sales, then would taper off.

But retail demand exceeded all expectations, November production went as high as 398,024 units for the United States alone, and December production was expected to approximate that figure.

A problem that became increasingly acute through 1935 was that of used cars. In over 90 per cent of all "deals," a new car going off the showroom floors meant another used car on the back lot. Manufacturers pushed used car sales to thaw their dealers' capital.

Depression-born, the preponderant number of low-priced cars to total registrations continued, but as total sales expanded the "middle-priced" class garnered a share of prosperity.

Forced to Medium Price Field

The high-price models continued to feel the depression, so much so that Lincoln brought out a medium-price model, and Cadillac put a lower-price Cadillac and LaSalle into competition.

However, of the 4,000,000-odd cars constituting 1935 production, the dominance of Ford and Chevrolet can quickly be seen when each made slightly more than 1,000,000 cars in the year. Ford made its millionth 1935 model six weeks before Chevrolet did and retained the leadership it assumed in 1934, but the margin between these two was closer at year-end. Plymouth retained third place.

WINDOWS OF WASHINGTON

WASHINGTON

IF THE steel industry could gaze into a crystal, what would it see in store for 1936 insofar as the President and congress are concerned? Either fortunately or unfortunately the industry cannot do this, so the only way to forecast the future is to glance at the shadows it is already casting.

All industry is wondering if the "breathing spell" will continue or if it is again going to be harassed by the President, congress, and the government departments during this new year.

And this in spite of the fact that Secretary of Commerce Roper, at every opportunity and apparently with authority, keeps reiterating that there will be a prolonged breathing spell. Perhaps, because the elections are not far distant, the President will not crack down on industry as he has in the past.

Congress convened on Jan. 3 and all of the political wiseacres in Washington are predicting that this will be a short session—by which they mean apparently that every effort will be made to get away from Washington by May 1.

Routine Will Absorb Time

It would seem as though a great deal of legislation, industrial and otherwise, can be passed in that time, but it must be taken into consideration that there is any amount of routine work that has to be done before adjournment, as for instance the passing of the appropriation bills

As to strictly class legislation affecting the steel industry, there is none in sight at this time, and none contemplated. That is, of course, always assuming that the Guffey coal law does not reach the United States Supreme Court before congressional adjournment.

Should the court sustain the constitutionality of that act, Senator Guffey already has stated publicly that he will introduce similar bills for various industries—and it is to be supposed that the steel industry would be one. However, there is little chance that the coal law will reach the Supreme Court and be acted on before adjournment.

One of the things that is staring industry in the face, however, is the soldiers' bonus. There is an agreement in the senate to take this up at once for consideration. All kinds of suggestions are being made by those who think they are "in on the know" in Washington; all the way from the idea that the President will not veto the bill when it is passed to the fact that he will veto it and that it will be passed over his veto.

Tax Snowball Still Rolling

At any rate, unless some special provision is made or some compromise is reached on the bonus, it would seem difficult for the administration to get away from this session without invoking new and additional taxes—providing the bonus becomes law. That is the last thing that Mr. Roosevelt wants to do, just before re-election.

Then, there has been renewed talk recently that sales tax adherents are getting stronger and stronger, but here again one runs up against the fact that the Democratic party does not want to enact any kind of tax legislation unless it is absolutely obligatory, because when the matter of taxes comes up, as well as tariff, there is no end in sight.

New NRA legislation ceased to be a threat when the President recently by executive order terminated most of NRA and transferred other portions to executive departments. The division of review, division of business co-operation, and advisory council went to Secretary of Commerce Roper, and the consumers division to Secretary of Labor Perkins. Presumably, this means extinction of the blue eagle.

One of the things which no one has yet been able to explain is the statement credited to the President from his vacation at Warm Springs to the effect that of the four bills he will insist upon at this session, continuation of the NRA will be one. This statement never has been denied by the White House.

It is anticipated that some time this year the Wagner labor disputes law will come up for final decision by the Supreme Court. This law, of course, has been prejudged unconstitutional by some of the best legal minds of the country retained by the American Liberty League, but the Supreme Court may not feel the same way about it. In the meantime, the national labor relations board continues along its merry way. At any rate, there is no chance of any additional legislation during this congress.

No matter what decision the Supreme Court makes regarding the AAA and its amendments, Secretary of Agriculture Wallace has announced that his department will be ready to meet it. By this he undoubtedly means that congress will be called upon for new legislation to adjust whatever the court finds wrong with the AAA. This would probably mean obtaining money in some other way.

Bills Hit at Industry

Three bills of paramount importance to industry as a whole now are pending in congress; this trio includes the 30-hour week bill, the Walsh government contract bill, and the O'Mahoney bill licensing all industry operating in interstate commerce.

The A. F. of L. has many times announced that it will back all three of these bills, and there is quite a general feeling among those who watch trends most closely in Washington that industry has not been concerned enough over these bills.

Other possible bills are being discussed by various members of the new deal. One of them includes a

(*Please turn to Page* 341)

Steel Activity on Upgrade After Strong Recovery Year

By A. J. HAIN
Associate Editor, STEEL

A BROADER, more convincing record of recovery was written by the steel industry in 1935.

Steel ingot production was up 30 per cent; pig iron 32 per cent, exceeding all expectations.

Few consuming industries failed to make definite gains, or to show evidence of impending improvement. In notable contrast with 1934, those industries which were not directly dependent on government aid forged ahead more rapidly than those that were. Business seemed to make more progress following the passing of NRA.

Steel ingot production, with December estimated, totaled 33,443,500 gross tons, compared with 25,599,118 tons in 1934. Coke pig iron output amounted to approximately 21,170,000 tons, against 15,977,679 tons.

Production moved in reverse order from 1934. It drifted downward moderately for five months—March to July. At the end of the first half both iron and steel output were about 1 per cent less than in the first six months of 1934. August brought a sharp rebound, and the last five months were notable for the steady rate of steelworks operations, between 47 and 57 per cent. For the last half, pig iron output was 82 per cent, and ingots 91 per cent over the last half of 1934.

The production figures for 1935 were the highest since 1930, when 39,286,287 tons of ingots and 31,441,488 tons of pig iron were produced.

Steelworks operated as an average in 1935 at about 50 per cent, compared with 19.7 per cent in 1932, 63 per cent in 1930, and 88.8 per cent in 1929.

The course of ingot production since 1929 may be visualized from these daily average

production figures, in gross tons:

1929	174,638	1933	72,884
1930	126,322	1934	81,224
1931	81,006	1935	106,000
1932	42,701		

From this it is evident output in 1936 needs to increase only 19 per cent to equal 1930—which was a good year.

Contributing to the rise in iron and steel output undoubtedly was the introduction of new automobile models in the fall. Output of motor cars in the United States last year, with December estimated, totaled 3,750,000, highest since 1929. For this year over 4,000,000 cars are forecast.

A buying wave for machine tools and equipment also set in with the fall months of 1935. Demand for household utilities and tin plate commodities was unusually strong, while farm implement and tractor production were the largest in 5 years.

Prices, like production, exhibited an unusual degree of stability. It was due mainly to volume, especially for the higher-priced products, that steelmakers' profits increased. In the first nine months the 17 leading integrated companies, representing 82 per cent of total steel ingot capacity, earned $26,900,000 compared with a deficit of $10,100,000 in the first nine months in 1934. Abandonment of the steel code in May was not followed, as some had expected, by reductions, except in very few products.

Scrap Led Upward Movement

An indication of the strong situation was the steady rise in scrap, beginning in May, leading up to the advance of $2 a ton in all semifinished steel prices, and $1 a ton in pig iron in November, to become effective on all new orders, and for the first quarter.

The steel industry's labor rates did not increase in 1935, but the industry absorbed its share of freight surcharges, while higher labor outlay due to the Guffey coal control act added to coal, coke and pig iron costs.

STEEL's iron and steel price composite, which includes scrap, stood at $33.30 in late December, a rise of $1.61 in the year, and highest since the week of June 11, 1930, in which it also was $33.30. The scrap composite was $13.16, an advance of $2.39 a ton from December, 1934. The finished steel index was $53.70, compared with $49.30 in December, 1934.

By November the scrap market at Chicago was the highest in six years, and heavy melting steel was on a parity with Pittsburgh, an unusual situation. For years Pittsburgh averaged $2 above Chicago, the spread some times being as much as $4.

Demand for scrap appeared insatiable. A. O. Smith Corp., Milwaukee, disposed of 30,000 to 50,000 tons. Among the largest scrap purchases were 40,000 tons in one commitment by National Tube Co., Lorain, O., and 20,000 tons by Carnegie-Illinois Steel Corp., Pittsburgh.

United States Steel Corp. wrecked a number of its plants for scrap including part of the Cleveland works of American Steel & Wire Co., Pennsylvania and Republic Works of National Tube Co., and Wellsville, O., works of American Sheet & Tin Plate Co.

Many of the railroads finding cars in such bad repair that wrecking was inevitable, began huge dismantling programs, including the Pennsylvania, with 32,000 cars, to yield about 450,000 tons.

Railroads' Purchasing Increasing

Railroads' purchases, as a whole, showed moderate improvement over 1934. Increased car loadings and the prospect for still further improvement, however, have led them to undertake more extensive buying programs for 1936, and recent inquiries make the outlook more promising.

Rail awards by carriers in the United States last year, with late December orders estimated, totaled 500,000 tons, compared with 260,000 tons in 1934. The largest purchase was made by Union Pacific—70,000 tons of rails and 30,000 tons of accessories—in November, in addition to 19,500 tons of rails earlier in the year.

One reason for the belief that rail awards will gain substantially in the first half of 1936, besides the apparent urgent need for them, is the rising trend of prices. The reduced price of standard rails was extended through 1935. Rails were under consideration for a $3 advance in November. When the price was reaffirmed for first quarter, for delivery before June 30, 1936, many producers considered that to be the final extension. Relaying rails were raised $1 to $2 a ton.

Domestic freight car awards, which include those placed with the railroads' own shops, for the year totaled approximately 20,000, compared with 23,829 in 1934. The Pennsylvania's allocation of 10,000 was the largest, while Chesapeake & Ohio placed 5125.

The year was a test period for light high-speed passenger trains and their popularity indicates more general adoption. Light-weight, high-tensile steels for car building made considerable strides.

Private building construction showed a definite gain in 1935, but was limited almost entirely to industrial structures. STEEL's record of structural shape awards, of 100 tons or more, with late December estimated, totaled 890,000 compared with 863,078 tons in the same period in 1934. Of the 1935 total, 169,110 tons, or 21 per cent, were for industrial and commercial structures, excluding railroads. In 1929 shape awards were 2,195,000 tons, and in 1933—low point since 1929, 801,500.

Though industrial construction was encouraging, the belief prevails that it will continue more or less restricted until after a cessation in government spending and an opportunity for capital to more fully appraise mounting tax burdens.

For plant expansion, the steel industry was among its own best customers. Four large steel mill buildings were contracted, including 16,000 tons for Great Lakes Steel Corp., 12,000 tons for Carnegie-Illinois Steel Corp., 10,000 tons for Bethlehem Steel Co. at Lackawanna, N. Y., and 8500 tons for American Sheet & Tin Plate Co. at Gary, Ind.

As in the preceding several years, structural shape demand came mainly from public work. About 27,000 tons were contracted for in Mississippi river locks and dams, and 58,000 tons or more for the Triboro bridge, New York.

When plans were formulated in April for the elimination of hundreds of railroad grade crossings, under allotment from the government's $4,800,000,000 relief program, it was estimated that 2,000,000 tons of steel would be required for such projects. These, with federal-aid school construction, now are just getting under way, and are among the most promising prospects for steel requirements early in 1936.

Private Construction Improving

The important feature in reinforcing bars, as in structural shapes, was the definite upturn in demand from private projects. While in the majority of instances this took the form of small lots for plant extensions, total tonnage was fairly large.

STEEL's record of reinforcing bar awards for the year, with late December estimated, totaled 349,900 tons compared with 216,455 tons in 1934. The Los Angeles water district purchased 83,790 tons at one time, in September, reported as the largest order for this material ever placed. In all, the district bought 108,019 tons of bars in 1935, besides 16,000 tons of plates and shapes.

Reinforcing bar prices were among the few to develop any notable weakness following the elimination of NRA. During midsummer concessions of $5 a ton or more were noted.

Only meager improvement came to the steel pipe industry in 1935. Few pipe line projects developed, and notable among these were contracts placed by the General Petroleum Co., Los Angeles, for 9250 tons; Chaplin Refining Co., Enid, Okla., 10,000 tons; Atlantic Refining Co., Phila-

delphia, 10,000 tons; and Simrall Pipe Line Co., an affiliate of the Standard Oil Co., of Ohio, 10,000 tons.

In the third quarter small-lot quantity extras on cold-drawn tubing were revised; otherwise pipe discounts and quantity extras were unchanged during the year.

Cast pipe business showed only a small pickup, most of which occurred late in the year when federal grants and loans speeded municipal work. The year's gain for the industry probably was not over 15 per cent. Cast pipe was advanced $1 a ton in April.

Quiet Year for Plates

Plates had a dull year. Railroads did only a moderate amount of repair work and freight car building was slow, although both were picking up at the end of the year, and with Pennsylvania's car program promised some substantial tonnages.

Structural work took the largest plate tonnages, though the increase over 1934 was small. Mississippi river locks and dams accounted for nearly 15,000 tons of fabricated steel, mainly plates; the government's navy program for 25,000 tons of plates, and Pittsburgh barge construction 19,000 tons.

The largest inquiry for plates in the history of the Pacific Coast came out in late December for 27,000 to 35,000 tons for the Los Angeles water district. Municipal tank work showed little change from 1934. Industrial tank construction expanded slowly but steadily.

Sheet mills had the best operations of any of the finishing departments, automobiles providing the strongest stimulus. Notable gains in consumption also were due to farm implements, household equipment, and miscellaneous industries. Demand for wide sheets was aided by automobile body designs.

Galvanized roofing sheets showed the first definite pickup in demand since the depression started.

Reflecting automobile demand, strip steel mill operations fluctuated between a low of 30 per cent, in August, to a high of 55-60 per cent reached in both March and November. This product continued to suffer from competition with slit sheets. Although no important changes were made in base prices, or extras, concessions of $3 a ton were reported on a few tonnages of strip and also sheets in the Detroit district late in the year.

Tin plate producers, after a banner first half, experienced a let-down in the last half of the year, although tota! production in 1935 was the highest since 1929. Most mills operated close to capacity in the first six months and made more tin plate in that period than in all 1934.

However, due to the fact that canmakers' releases were not up to expectations, a heavy mill inventory accumulated, reaching a peak in June at 6,000,000 base boxes, and reduced only to about 3,500,000 boxes at the close of 1935.

A new market for tin plate practically developed with the use of beer cans, and it is estimated about 600,000 tons will be required for these cans in 1936. Tin plate was firm at $5.25 per base box, Pittsburgh, throughout the year.

Heavier production of farm implements as well as increased automotive demand, was an important factor in stimulating bar demand. Business also was more diversified than during the preceding several years and this helped to swell the tonnage considerably.

The 1.80c, Pittsburgh, base on merchant steel bars was continued unchanged through 1935 until August, when it was raised $1 a ton. At the same time, a new quantity classification system was put into effect, whereby base was construed as 5 to 25-ton lots, with deductions for single shipments above this quantity, and additions for less than 5 tons. Extras for forging quality were reduced.

Cold-Finished Sales Up

Cold-finished carbon steel bar sales in 1935 were estimated at 30 to 40 per cent larger than in 1934, due mainly to farm implement and automotive requirements. Base prices were reduced $3 a ton in April to 1.95c, Pittsburgh. In December the price was raised to $3, but a similar reduction in chemical extras left net prices applying to most tonnage unchanged.

Gains in wire business were rather evenly divided among manufacturers' wire and wire products. While the automotive industry accounted for a large share of the pickup in the former, the increase in consumption by miscellaneous users was nearly as large. Farm buying of barb wire and fencing was the best in several years.

Important development in the pricing system was the introduction of quantity extras on wire products, plain wire not being affected. Plain wire price was unchanged throughout the year, but the new extras resulted in a 20-cent drop in the nail base.

Bolt, nut, and rivet producers experienced severe competition from welding and their volume of business failed to improve significantly in 1935 over 1934. Bolt and nut prices were weak and irregular, although greater steadiness was noted in the market in the last quarter than at any time in two or three years. In December bolt and nuts were advanced 3 to 10 per cent for first quarter.

All Semifinished Steels Advanced

Owing to improved tin plate and sheet demand, the semifinished steel market experienced the best volume since 1930. Semifinished steel prices were steady through the year at $27, Pittsburgh, for rerolling billets; $28 for sheet bars; $38 for wire rods, and 1.70c for skelp, until November when all these prices were advanced $2 a ton.

Forging billets were advanced $3 a gross ton Aug. 20. At the same time the base sizes were raised, extras applied, and the former base size of 4 x 4 inches put on a steel bar card, which with size extras in bars brought the price of 4 x 4-inch to $41 per net ton, compared with the former $32 per gross ton. Protests from forgers led, in November, to a restoration of smaller sizes to the forging billet classification, taking extras, however, of $2 a ton under 6 x 6 to 5 x 5-inch, and $4 a ton under 5 x 5 to 4 x 4-inch.

Pig iron shipments in the lakes districts in 1935 were about 75 per cent heavier than in 1934. Compared with 1932 the gain was more than 200 per cent. Makers of sanitary ware staged a big comeback, and production of stoves and radiation equipment also increased. Some integrated steel works, including Carnegie-Illinois Steel Corp., became active in the merchant iron market.

Pig iron prices were advanced $1 a ton Nov. 1. This was the first rise since July, 1934.

Lake iron ore shipments in 1935 at 28,362,368 tons were 27.4 per cent over 1934, highest since 1930.

North African and Swedish ore prices were raised in October, due to the advance in ocean freight rates caused by the Italo-Ethiopian war. The war brought strong demand for coke by-products and scrap from Italy, but relatively little finished steel. Japan was by far the larger purchaser of scrap.

As a result of the new Canadian and Brazilian trade treaties, affecting the price of manganese ore, ferromanganese was reduced $10 a ton to $75 effective Jan. 1.

Strike threats in Pennsylvania coal fields and a wage compromise stimulated the coke market and resulted in some price adjustments from the low point of the year, although Connellsville beehive furnace coke was only $3.65 at the year-end, compared with $3.60 in January. By-product foundry coke advanced 50 cents in October to $9.75, delivered Chicago.

B. K. PRICE and L. E. Browne, New York; W. G. Gude, Chicago; Edward A. France Jr., Pittsburgh, and G. H. Manlove, Cleveland, collaborated in this review of the markets in 1935.

Average Monthly Quotations in 1935

Base or furnace, unless otherwise specified; scrap, delivered to consumers

PITTSBURGH

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Structural Shapes	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c
Plates	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
Bars	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.85	1.85	1.85	1.85
Cold-Finished Steel Bars	2.10	2.10	2.10	2.00	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
Strip, Hot-Rolled	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Strip, Cold-Rolled	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
Standard Spikes	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.60
Plain Wire	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
Structural Rivets	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
No. 24 Hot-Rolled Annealed Sheets	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
No. 9-10 Blue Annealed Sheets	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
No. 24 Galvanized Sheets	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
Tin Plate, base box	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25
Wire Nails	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.55	2.40	2.40	2.40	2.40
Steel Pipe, 1 to 3-inch, % discount (base $200 per ton)	64	64	64	64	64	64	64	64	64	64	64	64
Bessemer Pig Iron, Neville Island base	$19.76	$19.76	$19.76	$19.76	$19.80	$19.81	$19.81	$19.81	$19.81	$19.81	$20.81	$20.81
Basic Pig Iron, Neville Island base	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	19.00	19.00
No. 2 Foundry Pig Iron, Neville Island base	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	19.50
Malleable Pig Iron, Neville Island base	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	19.50
Bessemer Ferrosilicon, 10 per cent (Jackson co. base)	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
Billets, Bessemer and Open-Hearth	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$28.50	$29.00
Sheet Bars, Bessemer and Open-Hearth	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	29.50	30.00
Wire Rods	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.50	40.00
Furnace Coke, spot	$3.60	$3.60	$3.60	$3.60	$3.60	$3.50	$3.30	$3.25	$3.25	$3.55	$3.55	$3.65
Foundry Coke, spot	4.60	4.60	4.60	4.60	4.60	4.60	4.25	4.00	4.00	4.35	4.35	4.25
Heavy Melting Steel Scrap	$13.50	$13.25	$12.40	$11.70	$12.00	$12.25	$12.30	$13.25	$13.45	$13.65	$13.65	$13.75
Low Phosphorus Scrap	15.15	15.00	14.30	15.00	15.40	15.25	15.10	15.50	16.15	16.50	16.00	16.00
No. 1 Cast Scrap	13.50	13.25	12.40	11.65	12.50	12.70	13.50	13.75	14.00	13.95	13.75	13.75

CHICAGO

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bars	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.90c	1.90c	1.90c
Plates	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Structural Shapes	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
Rail Steel Bars	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Bar Iron*	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
No. 24 Hot-Rolled Annealed Sheets	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53	2.53
*Terre Haute, Ind., base 5 cents less.												
No. 2 Foundry and Malleable Pig Iron	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.75	$19.50	$19.50
Southern No. 2 Pig Iron, delivered	18.72	18.72	18.72	18.72	18.72	18.72	18.72	18.72	18.72	18.72	19.72	19.72
Lake Superior Charcoal Iron, delivered Chicago	24.04	24.04	24.04	24.15	24.25	24.25	24.25	24.25	24.25	24.90	25.25	25.25
Heavy Melting Steel Scrap	$12.15	$11.65	$10.45	$10.05	$10.20	$10.25	$10.40	$12.35	$12.55	$12.50	$13.20	$00.00
Steel Specialties, Chicago	13.40	12.50	11.55	11.25	11.40	11.75	12.00	13.55	13.75	13.50	13.75	00.00
Rails for Rolling	12.90	12.55	11.55	11.05	11.05	11.25	11.25	13.65	13.90	14.00	14.30	00.00
Car Wheels, Iron	12.25	12.15	11.15	10.75	10.75	10.55	10.75	12.45	12.75	12.75	13.05	00.00
No. 1 Machinery Cast Scrap	11.55	10.90	9.45	9.25	9.40	9.55	9.55	10.95	11.55	11.75	12.00	00.00

EASTERN PENNSYLVANIA

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tank Plates, delivered Philadelphia	1.985c	1.985c	1.985c	1.985c	1.99c	1.99c	1.99c	1.99c	1.99c	1.99c	1.99c	1.99c
Structural Shapes, delivered Philadelphia	2.005	2.005	2.005	2.005	2.015	2.015	2.015	2.015	2.015	2.015	2.015	2.015
Bars, delivered Philadelphia	2.09	2.09	2.09	2.09	2.11	2.11	2.11	2.11	2.11	2.16	2.16	2.16
Bar Iron, common, delivered Philadelphia	1.89	1.89	1.89	1.89	1.91	1.91	1.91	1.91	1.91	1.98	2.06	2.06
No. 10 Blue Annealed Sheets, delivered Philadelphia	2.29	2.29	2.29	2.29	2.31	2.31	2.31	2.31	2.31	2.31	2.16	2.16
Basic Pig Iron, delivered	$19.76	$19.76	$19.76	$19.76	$19.81	$19.81	$19.81	$19.81	$19.81	$19.81	$20.81	$20.81
No. 2X Foundry Pig Iron, delivered Philadelphia	20.63	20.63	20.63	20.63	20.68	20.68	20.68	20.68	20.68	20.68	21.68	21.68
Standard Low Phosphorus Pig Iron, delivered	24.63	24.63	24.63	24.63	24.68	24.68	24.68	24.68	24.68	24.68	25.18	25.18
No. 1 Heavy Melting Steel Scrap	$11.40	$11.25	$10.60	$10.15	$10.45	$10.45	$10.30	$11.40	$12.20	$12.00	$12.05	$00.00
No. 1 Railroad Wrought Scrap	11.75	11.60	11.05	10.35	10.35	10.75	10.75	11.55	12.25	12.25	12.25	00.00
No. 1 Cupola Cast Scrap	11.60	11.95	11.75	11.55	11.50	11.50	11.50	11.60	12.25	12.25	12.75	00.00

COAL TAR PRODUCTS

Benzol, per gallon producers' plants, tank lots	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	17.25c	18.00c
Toluol, per gallon producers' plants, tank lots	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Solvent naphtha, per gallon producers' plants, tank lots	26.00	26.00	26.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Phenol, per pound, producers' plants in 200-lb. drums	16.30	16.30	16.30	16.30	16.30	16.30	16.30	16.30	16.30	16.30	16.30	16.30
Naphthalene flakes, per pound producers' plants	5.38	5.06	5.00	5.00	4.90	4.50	4.50	4.50	4.50	4.50	6.19	6.75
†Naphthalene balls, per pound producers' plants	5.38	5.06	5.00	5.00	4.90	4.50	4.50	4.50	4.50	4.50	6.19	6.75
Sulphate of Ammonia, per 100 lbs., Atlantic seaboard	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20	$1.20
†Western prices one-half cent higher.												

NONFERROUS METALS

Prompt, wholesale prices in cents per pound

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tin, Straits, spot, New York	50.883	50.009	46.935	50.189	51.100	51.087	52.290	50.415	49.072	51.188	51.824	51.125
Copper, electro, delivered Connecticut	9.000	9.000	9.000	9.000	9.000	8.880	7.995	8.222	8.771	9.202	9.250	9.250
Zinc, prime western, East St. Louis	3.730	3.714	3.897	4.034	4.224	4.300	4.326	4.541	4.675	4.827	4.854	4.850
Lead, open market, East St. Louis	3.542	3.380	3.429	3.542	3.812	3.872	3.973	4.104	4.263	4.362	4.350	4.350
Lead, open market, New York	3.692	3.532	3.579	3.692	3.962	4.020	4.123	4.254	4.413	4.512	4.500	4.500
Aluminum	20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	2.0000	20.000	20.000	20.000
Antimony, Chinese, spot, New York	14.337	14.500	14.500	14.279	13.904	12.750	12.750	13.000	13.542	15.490	14.826	14.750
Nickel, cathodes	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000	35.000

Monthly Price Averages for 10 Years

For averages for 1925 and previous years readers are directed to the issue of Jan. 7, 1935.

Ores and Alloys

Per Gross Ton

Iron Ore Prices at Date of Buying Movement, delivered lower lake ports

Season	Date buying movement	Old range Bessemer Ton	Old range Bessemer Cents per unit	Old range Nonbessemer Ton	Old range Nonbessemer Cents per unit	Mesabi Bessemer Ton	Mesabi Bessemer Cents per unit	Mesabi Nonbessemer Ton	Mesabi Nonbessemer Cents per unit	Iron prices, Valley Bessemer	Iron prices, Valley No. 2 Foundry
1935	May 4, 1935	$4.80	9.320	$4.65	9.029	$4.65	9.029	$4.50	8.738	$19.00	$18.50
1934	May 19, 1934	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1933	June 12, 1933	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	16.00	15.50
1932	June 3, 1932	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	14.50	14.50
1931	April 15, 1931	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	17.00	17.00
1930	April 1, 1930	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	19.00	18.50
1929	March 22, 1929	4.80	9.320	4.65	9.029	4.65	9.029	4.50	8.738	18.50	18.00
1928	April 16, 1928	4.55	8.835	4.40	8.544	4.40	8.544	4.25	8.252	17.50	17.25
1927	April 8, 1927	4.55	8.835	4.40	8.544	4.40	8.544	4.25	8.252	19.50	18.50
1926	March 17, 1926	4.55	8.835	4.40	8.544	4.40	8.544	4.25	8.252	21.00	20.50

Manganese Ore

Dollars Per Gross Ton, Duty Paid, Northern Atlantic Ports, on Basis of 50 Per Cent Ore

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70	$23.70
1934	21.70	22.70	22.70	22.70	22.70	22.70	22.70	22.70	23.20	23.70	23.70	23.70
1933	19.95	19.95	19.95	19.95	19.95	20.20	20.45	21.45	21.45	21.70	21.70	21.70
1932	22.70	22.70	22.70	22.70	21.70	21.70	21.70	21.70	21.20	21.20	21.20	20.70
1931	24.20	24.20	23.70	23.70	23.70	23.70	23.70	23.70	23.70	22.70	22.70	22.70
1930	29.95	24.70	24.70	24.70	24.70	24.70	24.70	24.20	24.20	24.20	24.20	24.20
1929	27.70	27.70	27.70	27.70	27.70	27.70	26.70	26.70	26.70	25.70	25.70	25.70
1928	30.20	30.20	30.20	30.20	30.20	30.20	30.20	30.20	30.20	30.20	29.20	29.20
1927	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70
1926	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70	30.70

Bessemer Ferrosilicon, 10 Per Cent

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75	$27.75
1934	27.25	27.25	27.25	27.25	27.75	27.75	27.75	27.75	27.75	27.75	27.75	27.75
1933	20.50	20.50	20.50	20.50	20.50	20.75	22.40	24.65	27.00	27.75	27.75	27.75
1932	23.00	22.00	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50
1931	25.00	25.00	25.00	25.00	25.00	25.00	25.00	24.00	23.00	23.00	23.00	23.00
1930	30.00	30.00	30.00	30.00	30.00	29.50	29.00	29.00	25.00	25.00	25.00	25.00
1929	31.00	31.00	31.00	31.00	31.00	31.00	31.00	30.20	30.00	30.00	30.00	30.00
1928	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
1927	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	33.50	32.00	30.00
1926	35.00	35.50	36.00	34.40	33.00	33.00	33.00	33.00	33.00	33.25	34.00	34.00

Ferrosilicon, 50 Per Cent

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50	$77.50
1934	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
1933	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50	74.50
1932	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	76.30
1931	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	77.50
1930	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50
1929	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50
1928	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50	83.50
1927	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00
1926	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00	85.00

Spiegeleisen, 20 Per Cent

At Producers' Furnaces

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00	$26.00
1934	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.06
1933	24.00	24.00	24.00	24.00	24.00	24.00	27.00	27.00	27.00	27.00	27.00	27.00
1932	27.00	27.00	27.00	27.00	27.00	26.50	25.00	25.00	25.00	25.00	24.25	24.00
1931	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	27.00
1930	34.00	34.00	34.00	34.00	34.00	34.00	33.00	33.00	33.00	33.00	33.00	30.00
1929	34.00	34.00	34.00	34.00	34.00	34.00	34.00	33.20	33.50	34.00	34.00	34.00
1928	32.00	32.00	32.00	32.00	32.00	32.00	33.00	33.00	33.00	33.00	33.00	34.00
1927	37.00	37.00	37.00	37.00	35.50	34.80	34.00	33.35	33.00	30.15	30.00	31.00
1926	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	34.00	38.75	37.00

Ferromanganese, 80 Per Cent, delivered Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$89.79	$89.79	$89.79	$89.85	$90.13	$90.13	$90.13	$90.13	$90.13	$90.13	$90.13	$90.13
1934	90.24	90.24	90.24	90.24	90.24	90.00	89.79	89.79	89.79	89.79	89.79	89.79
1933	73.24	73.24	73.24	73.24	73.24	73.24	84.44	87.24	87.24	87.24	87.24	87.24
1932	79.85	80.24	20.24	80.24	80.24	74.99	73.24	73.24	73.24	73.24	73.24	73.24
1931	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	89.79	79.79
1930	104.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	103.79	93.25
1929	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	109.79	104.79
1928	104.79	104.79	104.79	104.79	108.19	109.79	109.79	109.79	109.79	109.79	109.79	109.79
1927	104.79	104.79	104.79	104.79	98.54	94.79	94.79	94.79	94.79	94.79	94.79	103.42
1926	119.79	119.79	102.29	92.79	92.79	92.79	92.79	92.79	92.79	99.79	104.79	104.79

Duty of 1⅞ cents per pound contained manganese became effective on ferromanganese Sept. 21, 1922.

Ferrotungsten

Per Pound of Metallic Tungsten Contained

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35	$1.35
1934	1.16	1.16	1.16	1.20	1.35	1.45	1.35	1.35	1.35	1.35	1.35	1.35
1933	0.94	0.94	0.94	0.94	0.94	0.94	0.96	1.04	1.02	1.10	1.16	1.16
1932	1.10	1.10	1.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99
1931	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
1930	1.45	1.45	1.43	1.40	1.35	1.20	1.20	1.10	1.11	1.11	1.12	1.13
1929	1.04	1.04	1.09	1.30	1.32	1.36	1.38	1.43	1.45	1.45	1.45	1.47
1928	0.94	0.93	0.93	0.93	0.95	0.96	0.97	0.97	0.97	0.97	0.98	1.00
1927	1.05	1.05	1.01	1.00	0.93	0.98	0.96	0.94	0.92	0.92	0.92	0.95
1926	1.14	1.14	1.14	1.09	1.08	1.00	1.00	1.00	1.00	1.00	1.05	1.05

Ferrochrome, 4-6 Per Cent

Per Pound of Metallic Chromium Contained

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c	10.00c
1934	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
1933	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.60
1932	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	9.90
1931	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	10.25
1930	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1929	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1928	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1927	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50
1926	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50	11.50

Pig Iron

Per Gross Ton

Basic, Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$18.00	$19.00	$19.00
1934	17.00	17.00	17.00	17.60	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
1933	14.00	14.00	14.00	14.00	14.40	15.00	15.60	16.00	17.00	17.00	17.00	17.00
1932	15.00	15.00	15.00	15.00	15.00	14.50	14.00	14.00	14.00	14.00	14.00	14.00
1931	17.00	16.75	16.75	17.00	17.00	17.00	17.00	17.00	17.00	16.60	15.00	15.00
1930	18.50	18.50	18.50	18.50	18.50	18.50	18.25	18.00	17.75	17.00	17.00	17.00
1929	17.50	17.50	17.60	18.00	18.30	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1928	17.00	17.00	17.00	16.75	16.20	15.80	15.95	16.00	16.10	16.85	17.70	17.50
1927	18.50	17.85	18.50	19.00	18.10	17.90	17.50	17.50	17.15	17.00	17.00	17.00
1926	20.00	19.50	21.00	19.80	19.25	19.00	18.70	18.00	18.25	19.10	19.25	19.75

Bessemer, delivered Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$19.76	$19.76	$19.76	$19.76	$19.80	$19.81	$19.81	$19.81	$19.81	$19.81	$20.81	$20.81
1934	19.26	19.26	19.26	19.56	19.76	19.76	19.76	19.76	19.76	19.76	19.76	19.76
1933	15.76	15.76	15.76	16.26	16.66	17.26	17.86	18.26	19.26	19.26	19.26	19.26
1932	17.26	16.96	16.76	16.76	16.15	15.95	15.76	15.76	15.76	15.76	15.76	15.76
1931	18.76	18.51	18.26	18.26	18.26	18.26	18.26	18.26	18.26	18.16	17.76	17.51
1930	20.76	20.76	20.76	20.76	20.76	20.76	20.46	20.26	24.13	19.36	18.63	18.76
1929	19.96	19.86	20.11	20.26	20.56	20.76	20.76	20.76	20.76	20.76	20.76	20.76
1928	19.26	19.26	19.21	19.26	19.26	18.76	18.76	18.76	18.86	19.11	19.96	20.01
1927	21.26	20.76	21.16	21.26	20.86	20.66	20.26	20.26	19.86	19.76	19.76	19.26
1926	22.76	22.76	22.76	21.56	21.01	20.76	20.46	19.76	19.96	20.86	22.01	21.51

No. 2 Foundry, f.o.b. Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.75	$19.50	$19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	15.50	15.50	15.50	15.50	15.90	16.00	16.75	17.00	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.00	15.60	16.00	15.50	15.50	15.50	15.50	15.50	15.50
1931	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.20	17.00	16.60
1930	20.00	20.00	19.50	19.40	19.00	18.40	17.90	17.50	17.50	17.50	17.50	17.50
1929	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
1928	18.50	18.50	18.50	18.50	18.90	18.00	17.60	17.60	18.25	18.80	20.00	20.00
1927	20.90	20.25	20.00	20.00	20.00	20.00	20.00	19.50	19.50	18.75	18.50	18.50
1926	23.00	23.00	23.00	22.00	21.65	21.10	21.00	21.00	21.00	21.00	21.00	21.00

No. 2 Foundry, f.o.b. Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$19.50	$19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	14.50	14.50	14.50	14.50	14.75	15.50	16.10	16.50	17.50	17.50	17.50	17.50
1932	15.50	15.50	15.00	15.00	14.80	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1931	17.00	16.75	16.90	17.00	17.00	17.00	17.00	17.00	17.00	16.85	16.00	15.50
1930	18.50	18.50	18.50	18.50	18.50	17.63	18.00	18.00	17.75	17.20	17.00	17.00
1929	17.50	17.50	17.75	18.15	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1928	17.25	17.25	17.25	17.25	17.10	16.75	16.50	16.50	16.85	17.00	17.70	18.00
1927	18.43	18.06	18.37	18.50	18.50	18.20	17.50	17.50	17.50	17.50	17.45	17.25
1926	20.50	20.50	20.50	19.30	19.00	18.00	17.80	17.50	17.70	18.35	19.60	19.00

No. 2X Foundry, delivered Philadelphia

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$20.63	$20.63	$20.63	$20.63	$20.68	$20.68	$20.68	$20.68	$20.68	$20.68	$21.68	$21.68
1934	19.63	19.63	19.63	20.38	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63
1933	13.76	13.76	13.76	14.51	15.91	16.76	17.28	17.88	18.63	18.63	18.63	19.63
1932	15.76	15.76	15.76	15.66	15.13	14.76	14.76	14.51	14.26	14.16	13.95	13.88
1931	18.26	18.26	18.26	18.26	17.76	17.76	17.76	17.51	17.01	16.01	16.01	15.76
1930	21.56	21.26	20.76	20.76	20.26	20.26	20.26	19.76	19.76	19.26	19.13	18.26
1929	22.26	22.01	22.26	22.26	22.76	22.76	22.76	22.26	22.26	22.26	22.26	21.76
1928	20 51	20.91	21.26	21.26	21.26	21.26	20.76	20.76	21.01	21.76	21.51	21.76
1927	22.76	22.26	22.26	22.26	22.26	22.01	21.51	21.26	21.01	20.66	20.51	20.26
1926	24.26	24.01	23.26	23.26	23.01	22.76	22.26	22.01	22.26	22.51	23.51	23.76

No. 2X Foundry, f.o.b. Buffalo

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$19.50	$19.50
1934	17.50	17.50	17.50	18.25	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	16.50	16.50	16.50	16.50	16.50	16.50	17.10	17.15	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50
1931	18.00	18.00	18.00	18.00	17.60	17.50	17.50	17.50	17.50	17.50	17.50	17.50
1930	19.40	19.00	19.00	19.00	19.00	19.00	19.00	18.75	19.00	18.40	18.00	18.00
1929	19.00	19.00	19.25	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
1928	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	18.00	19.00	19.00
1927	19.75	18.90	18.15	18.00	18.00	17.90	17.50	17.45	18.00	18.00	17.60	17.50
1926	21.50	21.50	21.50	21.50	21.25	20.50	19.80	20.00	20.00	20.00	20.00	20.00

Southern No. 2, f.o.b Birmingham

Local delivery

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$14.50	$14.50	$14.50	$14.50	$14.50	$14.50	$14.50	$14.50	$14.50	$14.50	$14.75	$15.50
1934	13.50	13.50	13.50	14.25	14.50	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1933	11.00	11.00	11.00	11.40	12.00	12.00	12.60	13.00	13.50	13.50	13.50	13.50
1932	12.00	11.20	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1931	14 00	13.00	13.00	13.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
1930	14.70	15.00	14.50	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
1929	16.50	16.50	16.00	15.50	15.50	15.25	14.00	14.00	14.00	14.00	14.00	14.00
1928	16.00	16.00	16.00	16.00	16.00	15.90	15.50	15.65	16.25	16.25	16.30	16.50
1927	18.50	18.00	18.00	18.00	18.00	18.00	17.43	17.25	17.25	17.25	16.00	16.00
1926	22.75	22.00	22.00	22.00	22.00	21.00	21.00	21.00	20.80	20.00	20.00	20.00

Malleable, f.o.b. Valley

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$19.50	$19.50
1934	17.50	17.50	17.50	18.10	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	14.50	14.50	14.50	14.50	14.90	15.50	16.10	16.50	17.50	17.50	17.50	17.50
1932	16.00	15.50	15.50	15.50	15.00	14.50	14.50	14.50	14.50	14.50	14.50	14.50
1931	17.50	17.25	17.00	17.00	17.00	17.00	17.00	17.00	17.00	16.90	16.50	16.00
1930	19.00	19.00	19.00	19.00	19.00	19.00	18.75	18.50	18.35	17.80	17.50	17.50
1929	18.00	18.00	18.10	18.50	18.80	19.00	19.00	19.00	19.00	19.00	19.00	19.00
1928	17.25	17.25	17.25	17.25	17.25	17.00	17.00	17.00	17.10	17.35	17.90	18.00
1927	18.50	18.10	18.40	18.50	18.50	18.25	17.50	17.50	17.50	17.50	17.50	17.25
1926	20.50	20.50	20.50	19.30	19.00	18.00	17.80	17.50	17.70	18.35	19.75	19.00

Malleable, f.o.b. Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.50	$18.75	$19.50	$19.50
1934	17.50	17.50	17.50	18.10	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
1933	15.50	15.50	15.50	15.50	15.90	16.00	16.50	17.00	17.50	17.50	17.50	17.50
1932	16.50	16.50	16.50	16.00	15.60	16.00	15.50	15.50	15.50	15.50	15.50	15.50
1931	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.10	17.00	16.60
1930	20.00	20.00	19.50	19.40	19.00	18.40	17.90	17.50	17.50	17.50	17.50	17.00
1929	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00
1928	18.50	18.50	18.50	18.50	18.20	18.00	17.60	17.60	18.25	18.80	20.00	20.00
1927	20.90	20.25	20.00	20.00	20.00	20.00	20.00	19.50	19.50	18.75	18.50	18.50
1926	23.00	23.00	23.00	22.00	21.65	21.10	21.00	21.00	21.00	21.00	21.00	21.00

Basic, delivered Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$19.76	$19.76	$19.76	$19.76	$19.81	$19.81	$19.81	$19.81	$19.81	$19.81	$20.81	$20.81
1934	18.76	18.76	18.76	19.51	19.76	19.76	19.76	19.76	19.76	19.76	19.76	19.76
1933	13.50	13.50	13.50	14.19	15.99	18.19	16.79	17.20	17.76	17.76	17.76	18.76
1932	16.00	15.75	15.75	15.00	15.00	14.50	14.35	13.90	13.75	13.60	13.50	13.50
1931	17.25	17.25	17.25	17.25	17.00	17.00	16.75	16.75	16.00	16.00	16.00	16.00
1930	19.20	19.00	18.80	18.76	18.75	18.75	18.00	18.00	17.87	17.50	17.50	17.50
1929	20.15	20.50	20.25	20.25	20.50	20.25	19.85	19.85	19.85	19.75	19.75	19.75
1928	19.50	19.50	19.50	19.25	19.10	19.10	19.00	19.00	19.00	19.75	19.75	19.75
1927	21.25	21.00	21.00	20.90	20.75	20.75	20.50	19.75	19.75	19.50	19.50	19.25
1926	22.75	22.50	22.20	21.76	21.76	21.76	21.00	21.00	20.76	21.00	22.50	22.75

Standard Low Phosphorus, delivered Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$24.63	$24.63	$24.63	$24.63	$24.68	$24.68	$24.68	$24.68	$24.68	$24.68	$24.68	$24.68
1934	24.13	24.13	24.13	24.13	24.63	24.63	24.63	24.63	24.63	24.63	24.63	24.63
1933	20.75	20.50	20.50	20.50	21.68	22.00	22.80	23.50	23.13	23.13	23.13	24.13
1932	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
1931	24.76	24.76	24.76	24.76	24.76	23.76	23.76	23.76	23.76	23.76	23.76	23.76
1930	24.76	24.76	24.76	24.76	24.76	24.26	24.26	24.26	24.76	24.76	24.76	24.76
1929	24.26	24.26	24.26	24.26	24.26	24.26	24.26	24.26	24.76	24.76	24.76	24.76
1928	24.76	24.76	24.76	24.76	24.76	24.51	24.51	24.51	24.26	24.26	24.26	24.26
1927	25.76	25.76	25.76	25.76	25.76	25.76	25.76	25.26	25.26	25.26	24.76	24.76
1926	24.76	24.76	24.76	24.76	24.76	24.26	24.26	24.26	24.51	24.76	25.76	25.76

No. 2X, f.o.b. Virginia Furnace

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1933	$17.75	$17.75	$17.75	$17.75	$17.75	$17.75	$17.75	Not offered after July				
1932	18.00	18.00	18.00	18.00	18.00	18.00	18.00	17.75	17.75	17.75	17.75	17.75
1931	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.00	18.00	18.00
1930	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25	18.25
1929	21.25	21.25	21.00	20.75	20.75	20.00	20.00	20.00	20.00	19.65	18.25	18.25
1928	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	20.50	21.25
1927	21.75	22.00	22.00	22.00	22.00	22.00	22.00	21.50	21.50	21.50	21.25	21.00
1926	23.50	23.25	23.25	23.25	23.00	23.00	22.75	22.75	23.00	22.50	22.75	23.00

Lake Superior Charcoal, delivered Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$24.04	$24.04	$24.04	$24.15	$24.25	$24.25	$24.25	$24.25	$24.25	$24.90	$25.25	$25.25
1934	23.54	23.54	23.54	23.66	24.04	24.04	24.04	24.04	24.04	24.04	24.04	24.04
1933	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.54	23.54	23.54	23.54
1932	22.29	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04	23.04
1931	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	25.54	25.04	25.04	20.79
1930	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04
1929	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04
1928	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04
1927	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04	27.04
1926	29.04	29.04	29.04	29.04	29.04	29.04	29.04	29.04	29.04	27.04	27.04	27.04

Semifinished Material

Per Gross Ton f.o.b.

Bessemer Billets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$28.50	$29.00
1934	26.00	26.00	26.00	27.80	29.00	29.00	27.40	27.00	27.00	27.00	27.00	27.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	27.00	27.00	27.00	27.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	33.00	34.25	34.00	34.50	36.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75
1928	33.00	33.00	33.00	33.00	33.00	32.50	32.25	32.00	32.00	32.75	33.00	33.00
1927	35.00	34.00	33.60	33.50	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
1926	35.50	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00

Open-Hearth Billets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$27.00	$28.50	$29.00
1934	26.00	26.00	26.00	27.80	29.00	29.00	27.40	27.00	27.00	27.00	27.00	27.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	27.00	27.00	27.00	27.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	30.00	29.00	29.00	29.00	29.00	29.00	29.00	29.00
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	33.00	34.25	34.00	34.50	36.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75
1928	33.00	33.00	33.00	33.00	33.00	32.50	32.25	32.00	32.00	32.75	33.00	33.00
1927	35.00	34.00	33.60	33.50	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00
1926	35.50	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00

Open-Hearth Sheet Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$29.50	$30.00
1934	26.00	26.00	26.00	28.40	30.00	30.00	28.40	28.00	28.00	28.00	28.00	28.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	29.75	29.00	29.00	29.00	29.00	29.00	29.00	28.50
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	34.00	33.25	35.00	35.25	36.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75
1928	34.00	34.00	33.70	34.00	34.00	33.50	32.25	32.20	33.00	33.00	33.60	34.00
1927	36.00	35.00	34.00	33.75	33.75	33.50	33.50	33.50	33.90	34.00	34.00	34.00
1926	36.50	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00

Bessemer Sheet Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$28.00	$29.50	$30.00
1934	26.00	26.00	26.00	28.40	30.00	30.00	28.40	28.00	28.00	28.00	28.00	28.00
1933	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1932	27.50	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
1931	30.00	30.00	30.00	30.00	29.75	29.00	29.00	29.00	29.00	29.00	29.00	28.50
1930	33.80	33.00	33.00	33.00	32.20	31.25	31.00	31.00	31.00	31.00	31.00	30.50
1929	34.00	33.25	35.00	35.25	36.00	35.75	35.00	35.00	35.00	35.00	35.00	34.75
1928	34.00	34.00	33.70	34.00	34.00	33.50	32.25	32.20	33.00	33.00	33.60	34.00
1927	36.00	35.00	34.00	33.75	33.75	33.50	33.50	33.50	33.90	34.00	34.00	34.00
1926	36.50	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00

Wire Rods, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$38.00	$38.00	$38.00	$38.00	$38.00	$38.00	$38.00	$38.00	$38.00	$38.00	$38.50	$40.00
1934	36.00	36.00	36.00	37.20	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
1933	36.20	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	36.00
1932	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1931	35.00	35.00	36.00	36.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
1930	40.00	40.00	38.00	38.00	36.40	36.00	36.00	36.00	36.00	36.00	36.00	35.50
1929	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	42.00	40.00	40.00
1928	41.50	43.50	44.00	44.00	44.00	44.00	42.00	42.00	42.00	42.00	42.00	42.00
1927	45.00	43.50	43.00	42.50	42.00	42.00	43.00	43.00	43.00	42.50	41.00	40.00
1926	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00

By-Product Foundry Coke

Per Net Ton

Birmingham, ovens

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00
1934	5.00	5.00	5.00	5.40	5.50	5.70	6.00	6.00	6.00	6.00	6.00	6.00
1933	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.40	4.50	4.75	4.85	4.85
1932	4.50	4.50	4.50	4.50	4.50	4.50	4.25	4.50	4.50	4.50	4.15	4.00
1931	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.75
1930	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1929	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1928	5.00	5.00	5.00	3.95	4.80	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1927	5.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.25	5.00
1926	5.60	5.50	5.50	5.15	5.15	5.50	5.50	5.50	5.50	5.50	5.50	5.50

Chicago, ovens

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	$8.50	$9.00	$9.00	$9.00
1934	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50
1933	7.00	7.00	7.00	7.00	7.00	7.15	7.50	7.50	8.00	8.00	8.00	8.00
1932	7.50	7.50	7.50	7.50	7.30	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1931	8.00	8.00	8.00	8.00	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
1930	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1929	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1928	9.00	9.00	9.00	9.00	9.00	8.50	8.00	8.00	8.00	8.00	8.00	8.00
1927	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.30	9.00
1926	10.50	10.50	10.50	9.95	9.75	9.75	9.75	9.75	9.75	9.75	9.75	10.25

Newark, delivered

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$8.83	$9.20	$9.20	$9.20	$9.20	$9.20	$9.20	$9.20	$9.20	$9.20	$9.20	$9.20
1934	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71	8.71
1933	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.21	8.51	8.71	8.71	8.71
1932	8.76	8.76	8.76	8.76	8.23	8.21	8.21	8.21	8.21	8.21	8.21	8.21
1931	9.00	9.00	9.00	9.00	9.00	8.70	8.70	8.70	8.70	8.70	8.70	8.70
1930	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1929	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1928	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1927	9.84	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59	9.59
1926	11.01	11.01	11.01	9.59	9.59	9.59	9.59	9.59	9.59	9.59	10.59	10.59

St. Louis, delivered

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$9.25	$9.25	$9.25	$9.25	$9.25	$9.25	$9.25	$9.25	$9.25	$9.80	$10.00	$10.00
1934	9.25	9.25	9.25	9.25	9.25	9.25	9.25	9.25	9.25	9.25	9.25	9.25
1933	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	8.15	8.50	8.75	9.00
1932	8.50	8.50	8.50	8.50	8.50	7.95	7.75	7.75	7.75	7.75	7.75	7.75
1931	9.00	9.00	9.00	9.00	9.00	8.60	8.50	8.50	8.50	8.50	8.50	8.50
1930	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1929	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1928	9.75	9.75	9.75	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
1927	10.50	10.50	10.50	*9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.75
1926	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.25	10.50

*Granite City previous to April, 1927.

New England, delivered

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	$11.00	$11.40	$11.50	$11.50
1934	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.87	11.00
1933	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.30	10.50	10.50	10.50
1932	10.50	10.50	10.50	10.50	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
1931	11.00	11.00	11.00	11.00	11.00	10.50	10.50	10.50	10.50	10.50	10.50	10.50
1930	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1929	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1928	11.50	11.50	11.50	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
1927	13.50	12.65	12.50	12.50	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
1926	13.00	13.00	13.00	12.50	12.50	12.00	12.00	12.00	12.00	12.00	13.00	13.50

Beehive Coke

Per Net Ton

Foundry, Spot, Connellsville

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$4.60	$4.60	$4.60	$4.60	$4.60	$4.60	$4.25	$4.00	$4.00	$4.35	$4.35	$4.25
1934	4.25	4.25	4.25	4.55	4.60	4.60	4.60	4.60	4.60	4.60	4.60	4.60
1933	2.50	2.50	2.25	2.25	2.25	2.40	2.80	3.10	3.15	3.85	4.25	4.25
1932	3.25	3.25	3.25	3.25	3.15	3.00	3.00	2.90	2.75	2.75	2.65	2.50
1931	3.30	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
1930	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1929	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.55	3.50
1928	3.75	3.75	3.75	3.65	3.55	3.50	3.50	3.75	3.75	3.75	3.75	3.75
1927	4.25	3.85	4.15	4.05	3.80	3.90	4.00	4.00	4.00	3.75	3.75	3.65
1926	6.40	6.50	4.45	4.10	3.85	3.75	3.70	3.60	4.15	4.65	5.85	4.75

Furnace, Spot, Connellsville

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$3.60	$3.60	$3.60	$3.60	$3.60	$3.50	$3.30	$3.25	$3.25	$3.55	$3.55	$3.65
1934	3.60	3.50	3.35	3.30	3.45	3.60	3.60	3.60	3.60	3.60	3.60	3.60
1933	1.75	1.75	1.75	1.75	1.75	1.80	2.40	2.75	2.50	3.25	3.75	3.75
1932	2.25	2.25	2.25	2.25	2.15	2.00	2.00	2.00	2.00	2.00	1.80	1.80
1931	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40	2.40	2.40	2.35	2.30
1930	3.55	2.60	2.60	2.60	2.55	2.50	2.50	2.50	2.60	2.60	2.55	2.50
1929	2.75	2.90	2.95	2.75	2.75	2.75	2.75	2.75	2.65	2.65	2.65	2.65
1928	2.70	2.65	2.60	2.60	2.55	2.60	2.60	2.75	2.75	2.80	2.75	2.75
1927	3.35	3.35	3.30	3.20	2.80	2.85	2.90	3.00	2.85	2.85	2.80	2.65
1926	6.90	7.45	3.15	3.05	2.85	2.70	2.65	2.85	3.25	3.65	4.75	3.65

Iron and Steel Scrap

Per Gross Ton Delivered

Heavy Melting Steel, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$13.50	$13.25	$12.40	$11.70	$12.00	$12.25	$12.30	$13.25	$13.45	$13.65	$13.65	$13.90
1934	13.05	13.90	14.35	14.15	12.80	11.90	12.00	11.45	10.75	10.50	11.15	12.95
1933	8.35	8.25	8.75	9.90	11.65	11.65	12.70	13.75	13.00	12.45	11.65	11.50
1932	10.25	10.25	10.25	10.20	9.75	9.00	8.35	8.55	9.50	9.50	9.15	8.75
1931	13.00	12.75	12.90	12.50	11.25	10.30	10.50	10.70	10.80	10.45	10.25	10.25
1930	16.55	16.90	16.60	16.05	15.40	15.10	14.90	15.20	15.70	14.80	12.85	12.75
1929	19.00	18.60	18.50	18.60	17.85	18.30	18.45	18.90	18.45	17.30	16.30	15.10
1928	15.35	15.05	14.75	14.85	15.00	14.70	14.10	15.00	16.55	17.35	17.35	17.50
1927	17.00	16.10	16.40	16.50	15.50	15.10	14.95	15.00	15.00	14.50	14.50	14.60
1926	18.75	17.60	17.70	16.90	16.00	15.85	16.70	17.75	17.75	17.00	17.00	17.00

Heavy Melting Steel, Detroit (dealers)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$9.50	$9.35	$7.90	$7.50	$7.60	$8.40	$8.40	$9.30	$9.50	$9.50	$9.50	$9.75
1934	8.75	9.50	10.15	9.70	8.90	8.00	8.00	7.80	7.75	7.50	8.00	8.80
1933	4.50	4.50	4.50	5.40	7.75	7.80	8.95	9.50	8.55	7.35	7.00	7.25
1932	5.55	5.75	5.75	5.70	5.10	4.75	3.90	4.25	5.55	5.75	5.30	4.60
1931	9.50	9.50	9.15	8.65	8.15	7.40	7.55	7.30	6.80	6.15	6.00	5.80
1930	12.25	12.00	11.85	11.70	11.30	11.00	10.85	10.95	11.15	10.95	9.95	9.55
1929	14.20	14.35	14.05	14.25	13.90	13.50	13.75	14.35	14.20	13.40	12.40	12.50
1928	11.44	11.25	11.05	10.75	11.00	10.88	10.38	10.50	11.69	12.50	13.30	13.50
1927	12.50	12.50	12.70	12.88	11.88	11.50	11.56	11.75	11.70	11.50	11.38	11.25
1926	14.75	14.75	14.75	13.35	12.50	12.00	12.80	13.50	12.94	12.75	11.94	12.20

Heavy Melting Steel, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$12.15	$11.65	$10.45	$10.05	$10.20	$10.25	$10.40	$12.35	$12.55	$12.50	$13.20	$13.75
1934	10.44	10.87	12.00	11.75	11.13	9.75	9.55	9.25	8.65	8.75	9.00	10.15
1933	5.25	5.25	5.25	6.55	8.70	8.80	10.45	10.40	9.95	9.35	8.35	8.75
1932	7.25	6.80	6.75	6.55	6.20	5.60	4.50	5.40	5.75	6.00	5.75	5.50
1931	10.00	9.85	9.75	9.60	8.65	8.50	8.50	8.25	7.95	7.75	7.65	7.50
1930	12.65	13.25	13.20	13.00	12.55	12.05	12.00	12.00	12.25	11.55	10.20	10.00
1929	16.50	16.00	15.55	15.95	15.45	14.95	14.75	15.05	15.05	14.45	13.05	12.50
1928	12.25	12.55	12.75	12.75	12.95	12.60	12.30	12.65	12.90	13.75	14.50	14.50
1927	13.20	13.10	13.05	13.10	12.35	12.00	12.10	12.35	12.20	11.75	11.50	11.95
1926	14.95	13.75	14.00	13.20	12.25	12.65	14.20	14.00	14.10	13.05	13.00	12.90

Heavy Melting Steel, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$11.40	$11.25	$10.60	$10.15	$10.45	$10.45	$10.30	$11.10	$12.20	$12.00	$12.05	$12.25
1934	11.63	11.73	11.70	11.50	11.00	10.40	10.25	9.85	9.60	9.50	9.95	10.85
1933	6.50	6.50	6.50	6.90	9.00	9.50	10.55	12.00	10.70	10.20	9.55	10.50
1932	7.50	7.35	7.35	7.20	6.50	6.25	6.25	6.40	7.25	7.25	7.25	6.50
1931	10.50	10.50	10.50	10.00	9.50	8.75	8.25	8.55	8.75	8.20	7.95	7.50
1930	14.50	14.50	14.95	13.95	13.40	13.25	12.50	12.65	13.00	12.00	11.50	11.00
1929	16.50	16.30	16.25	17.00	16.25	16.25	16.50	16.75	16.37	15.80	15.15	14.50
1928	14.00	14.00	13.75	13.75	13.75	13.15	12.75	12.75	14.65	16.00	15.90	15.50
1927	15.60	15.00	14.75	14.75	14.45	14.25	13.75	13.75	14.00	14.00	14.00	14.00
1926	17.35	16.35	16.20	15.90	15.25	15.25	15.50	16.75	16.85	16.65	15.95	15.50

No. 1 Railroad Wrought, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$11.00	$10.55	$9.40	$9.00	$8.75	$8.75	$8.75	$9.60	$9.75	$9.75	$10.00	$10.25
1934	8.87	9.12	9.63	9.75	9.30	8.50	8.35	8.00	7.60	7.25	7.25	9.15
1933	5.00	5.00	5.00	5.50	8.10	8.10	10.20	10.35	9.25	9.10	8.10	7.50
1932	7.25	6.85	6.25	5.85	5.25	5.00	4.60	4.50	5.60	5.60	5.60	5.00
1931	9.50	9.25	9.00	8.80	8.40	8.25	8.25	8.25	8.00	8.00	8.00	7.45
1930	13.40	13.70	13.50	13.30	12.70	11.50	11.25	11.25	11.25	10.95	10.20	10.00
1929	14.75	15.75	16.00	16.65	16.40	15.40	14.85	15.40	15.70	14.85	13.85	13.25
1928	12.65	12.40	12.45	12.45	13.05	12.70	12.30	12.40	12.90	13.50	14.25	14.50
1927	14.20	13.95	13.50	13.50	12.75	12.10	12.35	13.45	12.70	11.40	11.25	11.25
1926	15.00	14.40	14.50	14.05	12.55	12.65	14.80	14.75	14.56	14.50	13.75	13.75

No. 1 Railroad Wrought, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$11.75	$11.60	$11.05	$10.35	$10.35	$10.75	$10.75	$11.55	$12.25	$12.25	$12.25	$12.25
1934	12.75	12.75	12.75	12.25	11.55	10.00	10.20	9.80	9.50	10.25	10.70	11.65
1933	6.50	6.50	6.75	7.35	10.25	10.25	11.60	13.00	11.60	10.75	10.15	11.00
1932	9.35	9.00	9.00	7.95	7.75	6.70	6.25	6.25	7.25	7.25	7.25	6.50
1931	13.25	12.50	11.00	11.00	11.00	10.50	10.00	9.75	9.75	9.50	9.50	9.50
1930	15.25	15.25	15.25	15.75	15.40	15.25	14.25	14.25	14.25	14.25	13.50	13.50
1929	15.50	16.25	16.25	16.25	16.25	16.25	16.25	16.25	16.13	16.00	16.25	15.25
1928	15.25	15.25	15.25	15.25	15.25	15.25	15.25	14.80	15.10	15.50	15.50	15.50
1927	17.00	17.00	17.65	16.75	16.75	16.75	16.25	15.95	15.75	15.75	15.75	15.75
1926	18.35	18.00	18.00	17.75	17.35	17.00	17.00	17.25	17.00	17.00	17.00	17.00

No. 1 Cast, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$13.50	$13.25	$12.40	$11.65	$12.50	$12.70	$13.50	$13.75	$14.00	$13.95	$13.75	$13.75
1934	12.50	12.65	13.10	12.85	12.40	13.00	13.00	12.40	12.00	12.00	12.20	13.50
1933	8.55	9.00	9.00	9.00	10.10	10.40	10.65	10.60	10.60	11.20	11.00	11.00
1932	10.00	9.80	9.50	9.50	9.20	9.00	8.60	8.50	9.50	9.50	9.25	9.00
1931	12.50	12.50	12.50	12.20	11.50	10.85	10.00	10.00	10.00	10.00	10.00	10.00
1930	14.75	14.50	14.50	15.00	14.50	14.00	14.00	14.00	14.00	13.40	12.40	12.50
1929	15.30	14.50	15.20	15.45	15.00	15.00	15.00	15.00	15.00	15.00	14.90	14.50
1928	14.50	14.50	14.50	14.75	14.60	14.00	14.00	14.05	14.25	14.55	15.10	14.70
1927	16.00	15.60	15.60	16.00	15.75	15.10	15.00	15.00	15.00	14.70	14.50	14.50
1926	17.40	16.86	17.00	17.00	16.25	15.85	15.60	16.85	16.40	16.10	16.00	16.00

No. 1 Cast, Eastern Pennsylvania

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$11.60	$11.95	$11.75	$11.55	$11.50	$11.50	$11.50	$11.60	$12.25	$12.25	$12.75	$12.75
1934	11.50	11.65	12.30	12.50	12.15	12.00	11.25	11.00	11.00	11.00	11.00	11.25
1933	9.00	9.00	9.00	9.10	10.25	10.35	11.20	11.75	12.40	12.00	11.95	12.00
1932	11.20	10.00	10.00	9.50	9.25	9.00	9.00	9.25	9.25	9.00	9.00	9.00
1931	12.80	13.00	13.00	13.00	12.75	12.50	12.50	12.50	12.50	12.50	11.70	11.50
1930	16.00	15.75	15.75	15.50	15.00	14.75	13.50	13.50	13.50	13.50	13.50	12.50
1929	16.75	16.75	16.50	16.50	16.50	16.50	16.50	16.50	16.25	16.25	16.00	16.00
1928	16.75	16.75	16.75	16.25	16.25	16.00	16.00	15.75	16.20	17.00	16.50	16.50
1927	17.75	17.50	17.50	17.25	17.25	16.75	16.35	16.25	16.25	16.25	16.75	16.75
1926	18.35	18.25	18.25	18.25	18.00	17.75	17.80	18.25	18.15	17.75	17.75	17.75

No. 1 Cast, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$11.55	$10.90	$9.40	$9.25	$9.40	$9.55	$9.55	$10.95	$11.55	$11.75	$12.00	$12.25
1934	8.90	9.00	9.05	9.05	9.00	8.50	8.50	8.50	8.15	8.40	8.75	9.55
1933	5.95	6.00	6.20	7.15	8.75	8.75	9.90	10.50	9.85	9.25	8.00	8.25
1932	8.90	8.90	8.40	7.85	7.00	6.40	6.15	6.45	7.30	7.30	6.85	6.70
1931	10.65	10.65	10.65	10.25	9.80	9.80	9.80	9.80	9.80	9.80	9.00	8.95
1930	15.10	15.25	15.70	15.60	14.80	14.25	13.45	13.45	13.45	12.90	10.95	10.65
1929	17.70	17.90	17.90	17.90	17.25	16.25	16.25	16.25	16.80	15.65	15.35	15.10
1928	15.75	15.75	15.65	15.65	15.90	15.95	15.95	15.95	16.30	16.55	16.90	17.35
1927	18.90	18.90	18.50	18.10	17.35	16.65	16.55	16.80	16.80	16.25	15.85	15.70
1926	19.40	18.75	18.75	18.65	18.05	18.15	19.55	19.00	18.95	17.90	18.35	18.50

Cast Borings, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$6.50	$6.90	$7.00	$6.10	$6.00	$6.65	$6.50	$7.00	$7.30	$8.15	$8.15	$8.50
1934	7.30	8.15	8.70	8.50	8.25	7.75	7.25	7.05	6.25	5.50	5.90	6.00
1933	5.70	5.70	5.55	5.70	6.90	7.65	9.05	9.80	9.05	8.30	7.60	7.50
1932	6.75	6.50	6.75	6.65	6.40	5.50	4.75	5.15	5.95	6.25	6.50	5.90
1931	7.70	7.70	7.65	7.60	7.50	7.75	7.05	7.50	7.45	7.50	7.10	6.80
1930	11.10	12.00	11.15	10.75	10.50	9.88	8.50	8.50	8.90	8.40	7.75	7.15
1929	12.55	12.25	11.50	12.15	11.55	11.85	12.10	12.50	12.40	11.80	11.15	10.75
1928	11.50	11.00	10.70	10.60	10.70	10.40	9.80	10.50	12.00	12.40	12.00	12.50
1927	12.50	12.00	12.10	12.38	11.13	10.50	10.50	11.50	11.30	11.00	11.00	11.60
1926	14.75	14.25	13.25	12.60	11.75	11.85	12.20	12.75	13.00	12.60	12.50	12.00

Low Phosphorus Scrap, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$15.15	$15.00	$14.30	$15.00	$15.40	$15.25	$15.10	$15.50	$16.15	$16.50	$16.00	$16.00
1934	16.00	16.25	16.90	16.90	15.55	14.45	14.50	14.00	13.50	13.40	13.75	15.00
1933	10.00	10.25	10.70	11.10	13.55	13.70	14.55	16.00	15.10	14.30	13.50	13.50
1932	13.90	13.00	13.15	13.85	13.00	12.00	10.60	10.50	10.50	10.60	10.75	10.50
1931	17.20	17.50	17.50	17.20	16.25	14.75	13.50	14.00	14.00	14.00	14.00	14.00
1930	21.50	21.75	21.85	21.60	20.50	19.50	19.00	19.35	20.00	19.30	17.60	17.50
1929	22.00	22.50	22.35	23.25	22.40	22.25	22.50	22.80	23.00	22.20	21.75	20.50
1928	18.85	18.50	18.20	18.35	18.50	18.50	18.50	19.00	20.00	20.75	21.00	21.00
1927	20.25	19.50	20.00	20.50	19.10	19.10	19.00	19.00	20.00	19.50	18.60	18.50
1926	24.00	22.00	21.50	20.90	19.50	19.75	20.30	21.75	21.60	20.25	20.40	20.30

Machine Shop Turnings, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$8.95	$8.80	$7.40	$7.40	$8.15	$8.25	$8.15	$8.80	$9.55	$9.70	$9.45	$9.75
1934	9.05	10.00	10.75	10.15	8.20	7.45	7.50	8.00	7.30	7.00	7.20	8.50
1933	6.25	6.25	6.30	6.75	8.00	8.40	9.35	10.45	9.75	9.30	8.00	8.00
1932	6.95	7.10	7.25	6.75	6.30	5.25	5.00	5.25	5.95	6.00	6.25	6.00
1931	6.00	6.80	7.80	7.30	6.75	6.50	6.70	7.30	7.50	7.20	7.00	7.00
1930	11.50	11.75	11.00	11.00	10.20	9.50	8.70	8.00	8.00	7.20	6.15	6.00
1929	12.50	11.25	10.65	11.05	11.00	11.35	11.85	12.40	12.00	11.40	10.75	10.25
1928	10.60	10.15	10.15	10.25	9.90	9.20	8.80	9.65	11.00	11.25	10.85	12.00
1927	12.00	11.00	11.60	12.40	11.15	10.50	10.85	12.50	11.75	11.50	11.15	11.45
1926	14.50	13.60	13.00	12.60	11.65	11.00	11.60	12.85	13.05	12.00	11.85	11.50

Iron Car Wheels, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$12.25	$12.15	$11.15	$10.75	$10.75	$10.75	$10.75	$12.45	$12.75	$12.75	$13.05	$13.25
1934	10.75	11.50	12.50	12.25	12.00	10.40	10.25	10.00	9.75	9.75	9.75	10.60
1933	7.65	8.15	8.35	8.75	9.75	9.75	9.75	9.75	9.75	9.50	9.25	9.75
1932	7.75	7.00	7.00	6.75	6.35	6.00	5.50	6.15	7.00	7.00	7.10	7.00
1931	11.25	10.75	10.60	9.50	9.25	10.20	10.00	9.90	9.50	9.50	9.00	8.75
1930	14.05	14.20	14.50	14.45	13.80	13.50	13.50	13.50	13.50	13.10	12.00	11.50
1929	14.10	14.50	14.50	14.75	14.50	14.20	13.60	14.00	14.00	14.00	13.60	13.65
1928	13.70	14.25	13.95	13.50	13.45	13.10	13.00	13.00	13.00	13.10	14.05	14.05
1927	14.95	15.10	15.00	14.85	14.00	13.50	13.80	14.75	14.25	13.50	13.15	13.40
1926	18.00	16.30	16.70	16.45	15.65	15.40	16.50	16.50	15.75	14.50	14.50	14.60

Rails for Rolling, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$12.90	$12.55	$11.55	$11.05	$11.05	$11.25	$11.25	$13.65	$13.90	$14.00	$14.30	$14.75
1934	11.25	12.00	12.75	12.75	12.37	11.25	10.95	10.50	10.10	9.85	10.25	11.40
1933	8.00	7.75	7.95	8.50	10.25	10.25	11.15	11.25	11.25	11.10	10.25	10.25
1932	10.30	9.85	9.50	8.90	8.25	7.75	6.60	6.50	7.00	8.00	8.25	8.00
1931	13.00	12.10	12.00	11.85	11.15	10.90	10.50	10.50	10.50	10.50	10.00	10.00
1930	14.65	14.80	15.00	15.00	14.85	14.55	14.50	14.50	14.50	14.10	13.10	13.00
1929	17.10	17.50	17.50	17.50	17.50	17.50	17.50	17.75	17.60	17.05	15.30	14.60
1928	15.00	15.00	14.45	14.00	14.35	14.85	14.50	15.00	15.80	16.40	16.50	16.50
1927	16.00	16.00	15.50	15.85	15.10	14.60	14.60	15.00	15.20	14.70	13.95	14.00
1926	17.55	16.30	16.50	16.00	14.95	15.10	17.10	17.25	17.25	16.85	16.50	16.50

Finished Material

Per pound f.o.b.

Steel Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.85c	1.85c	1.85c	1.85c
1934	1.75	1.75	1.75	1.85	1.90	1.90	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.75	1.75	1.75
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.65	1.65	1.65	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.60
1930	1.90	1.85	1.85	1.80	1.75	1.75	1.70	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.90
1928	1.80	1.85	1.90	1.85	1.85	1.85	1.85	1.85	1.90	1.95	1.95	1.90
1927	1.95	1.90	1.90	1.90	1.85	1.85	1.80	1.80	1.80	1.75	1.75	1.80
1926	2.00	2.00	2.00	2.00	1.95	1.90	2.00	2.00	2.00	2.00	2.00	2.00

Tank Plates, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c
1934	1.70	1.70	1.70	1.80	1.85	1.85	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.55	1.50	1.55	1.60	1.60	1.60	1.70	1.70	1.70
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.65	1.65	1.65	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.50
1930	1.90	1.85	1.80	1.80	1.75	1.70	1.65	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90
1928	1.80	1.85	1.90	1.85	1.85	1.85	1.85	1.85	1.90	1.95	1.95	1.90
1927	1.90	1.85	1.90	1.85	1.85	1.80	1.80	1.80	1.80	1.75	1.75	1.80
1926	1.90	1.85	1.85	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90

Structural Shapes, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c	1.80c
1934	1.70	1.70	1.70	1.80	1.85	1.85	1.80	1.80	1.80	1.80	1.80	1.80
1933	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.70	1.70	1.70
1932	1.55	1.50	1.55	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1931	1.60	1.60	1.60	1.65	1.65	1.65	1.60	1.60	1.60	1.60	1.60	1.50
1930	1.90	1.85	1.80	1.80	1.75	1.70	1.65	1.65	1.60	1.60	1.60	1.60
1929	1.90	1.90	1.90	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90
1928	1.80	1.85	1.90	1.85	1.85	1.85	1.85	1.85	1.90	1.95	1.95	1.90
1927	1.95	1.90	1.90	1.90	1.85	1.80	1.80	1.80	1.80	1.75	1.75	1.80
1926	1.90	1.90	1.90	1.90	1.90	1.90	2.00	2.00	2.00	2.00	2.00	2.00

No. 10 Blue Annealed Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c
1934	1.75	1.75	1.75	1.90	2.00	2.00	1.85	1.85	1.85	1.85	1.85	1.85
1933	1.65	1.60	1.55	1.55	1.55	1.65	1.75	1.65	1.70	1.75	1.75	1.75
1932	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1931	1.90	1.90	1.90	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85
1930	2.15	2.10	2.10	2.10	2.00	2.00	2.00	1.95	1.95	1.95	1.90	1.90
1929	2.10	2.10	2.10	2.15	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.15
1928	2.10	2.10	2.10	2.05	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.10
1927	2.25	2.20	2.20	2.20	2.25	2.25	2.25	2.25	2.25	2.15	2.10	2.10
1926	2.50	2.50	2.50	2.50	2.45	2.35	2.30	2.30	2.30	2.35	2.40	2.40

Automobile Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c	2.95c
1934	2.75	2.75	2.75	3.05	3.15	3.10	2.95	2.95	2.95	2.95	2.95	2.95
1933	2.40	2.45	2.45	2.55	2.55	2.55	2.55	2.60	2.75	2.75	2.75	2.75
1932	2.90	2.85	2.85	2.80	2.80	2.80	2.80	2.70	2.75	2.65	2.60	2.60
1931	3.30	3.30	3.30	3.15	3.05	3.10	3.10	3.10	3.10	3.10	3.10	3.00
1930	3.90	3.90	3.90	3.80	3.80	3.60	3.60	3.60	3.60	3.45	3.35	3.30
1929	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.10	4.05	4.00	4.00
1928	4.00	4.10	4.15	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.05	4.10
1927	4.20	4.15	4.15	4.15	4.25	4.25	4.25	4.25	4.25	4.15	4.15	4.10
1926	4.50	4.40	4.40	4.35	4.30	4.25	4.20	4.25	*4.25	4.25	4.25	4.25

*No. 22 gage previous to September, 1926; No. 20 gage since.

No. 24 Black Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c
1934	2.25	2.25	2.25	2.50	2.65	2.65	2.45	2.40	2.40	2.40	2.40	2.40
1933	2.05	2.00	2.00	2.00	2.00	2.10	2.25	2.25	2.25	2.25	2.25	2.25
1932	2.20	2.15	2.20	2.20	2.20	2.20	2.20	2.15	2.10	2.10	2.10	2.20
1931	2.35	2.35	2.35	2.25	2.25	2.15	2.40	2.40	2.40	2.40	2.40	2.40
1930	2.70	2.65	2.65	2.65	2.55	2.55	2.55	2.50	2.40	2.40	2.35	2.35
1929	2.85	2.85	2.85	2.90	2.95	2.95	2.85	2.85	2.85	2.80	2.75	2.75
1928	2.80	2.85	2.85	2.75	2.75	2.70	2.65	2.65	2.70	2.70	2.80	2.85
1927	2.95	2.90	2.90	2.80	2.90	3.00	3.00	3.00	3.00	2.95	2.80	2.75
1926	3.35	3.35	3.25	3.25	3.20	3.10	3.10	3.10	*3.05	3.05	3.10	3.10

*No. 28 gage before Sept. 1, 1926.

No. 24 Galvanized Sheets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c	3.10c
1934	2.85	2.85	2.85	3.10	3.25	3.25	3.10	3.10	3.10	3.10	3.10	3.10
1933	2.70	2.50	2.60	2.65	2.70	2.70	2.85	2.85	2.85	2.85	2.85	2.85
1932	2.80	2.75	2.80	2.85	2.85	2.85	2.85	2.80	2.75	2.80	2.85	2.85
1931	2.90	2.90	2.90	2.85	2.80	2.80	2.90	2.90	2.90	2.90	2.90	2.90
1930	3.35	3.30	3.30	3.30	3.25	3.20	3.15	3.10	3.00	3.00	2.95	2.90
1929	3.60	3.60	3.60	3.65	3.70	3.65	3.60	3.55	3.50	3.50	3.45	3.40
1928	3.65	3.65	3.75	3.65	3.65	3.55	3.50	3.50	3.50	3.50	3.55	3.60
1927	3.80	3.70	3.70	3.65	3.80	3.80	3.85	3.85	3.85	3.80	3.70	3.60
1926	4.60	4.60	4.60	4.60	4.55	4.30	4.30	4.30	*3.95	3.90	3.95	3.95

*No. 28 gage before Sept. 1, 1926.

Cold-Finished Steel Bars, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.10c	2.10c	2.10c	2.00c	1.95c	1.95c	1.95c	1.95c	1.95c	1.95c	1.95c	1.95c
1934	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10
1933	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.95	1.95	1.95	1.95	1.95
1932	2.00	2.00	1.90	1.90	1.75	1.70	1.70	1.70	1.70	1.70	1.70	1.70
1931	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.00
1930	2.15	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.05	2.00
1929	2.20	2.20	2.25	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.20	2.20
1928	2.30	2.25	2.25	2.20	2.20	2.15	2.10	2.15	2.20	2.20	2.20	2.20
1927	2.35	2.35	2.40	2.40	2.40	2.35	2.30	2.30	2.20	2.15	2.10	2.10
1926	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.45	2.40	2.40

Tin Plate, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25	$5.25
1934	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25
1933	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.65	4.65	4.65	5.25
1932	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.50	4.25
1931	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	4.75	4.75	4.75
1930	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.00	5.00	5.00
1929	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35	5.35
1928	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.30	5.35
1927	5.50	5.50	5.50	5.50	5.50	5.45	5.50	5.50	5.50	5.30	5.30	5.25
1926	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.50

Cold-Rolled Strip, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c	2.60c
1934	2.40	2.40	2.40	2.65	2.80	2.80	2.60	2.60	2.60	2.60	2.60	2.60
1933	1.95	1.80	1.85	1.80	1.90	2.00	2.25	2.25	2.30	2.40	2.40	2.40
1932	2.00	1.90	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.95	2.00	2.00
1931	2.25	2.25	2.25	2.20	2.15	2.15	2.15	2.15	2.15	2.15	2.10	2.05
1930	2.70	2.65	2.60	2.55	2.50	2.45	2.45	2.40	2.35	2.35	2.35	2.25
1929	2.85	2.85	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1928	3.00	3.10	3.15	*2.75	2.75	2.75	2.75	2.70	2.75	2.75	2.80	2.85
1927	3.10	2.90	2.95	3.00	3.00	3.25	3.25	3.25	3.15	2.95	2.95	3.00
1926	3.90	3.90	3.90	3.85	3.75	3.70	3.65	3.50	3.50	3.50	3.25	3.25

*April, 1928, and subsequently, prices are for 3 tons or over instead of less than 3 tons.

Hot-Rolled Strip, Wide, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c	1.85c
1934	1.75	1.75	1.75	1.95	2.00	2.00	1.85	1.85	1.85	1.85	1.85	1.85
1933	1.45	1.45	1.45	1.45	1.55	1.55	1.60	1.65	1.70	1.75	1.75	1.75
1932	1.40	1.40	1.40	1.45	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45
1931	1.55	1.55	1.55	1.55	1.50	1.50	1.55	1.55	1.55	1.55	1.50	1.45
1930	1.85	1.80	1.80	1.70	1.70	1.70	1.65	1.65	1.65	1.60	1.55	1.55
1929	1.80	1.85	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
1928	1.85	1.85	1.90	1.90	1.85	1.85	1.90	1.85	1.80	1.80	1.80	1.80
1927	2.20	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.00	1.90
1926	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30

Plain Wire, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c	2.30c
1934	2.20	2.20	2.20	2.25	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
1933	2.15	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.10	2.20
1932	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
1931	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
1930	2.40	2.40	2.40	2.40	2.35	2.30	2.30	2.30	2.30	2.30	2.30	2.25
1929	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40
1928	2.40	2.45	2.50	2.50	2.50	2.50	2.45	2.40	2.40	2.40	2.40	2.50
1927	2.50	2.45	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
1926	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50

Wire Nails, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60	$2.55	$2.40	$2.40	$2.40	$2.40
1934	2.35	2.35	2.35	2.50	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
1933	1.90	1.85	1.85	1.85	1.85	1.85	2.05	2.10	2.10	2.10	2.10	2.35
1932	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
1931	1.90	1.90	1.90	1.90	1.90	1.80	1.85	1.90	1.90	1.90	1.90	1.90
1930	2.35	2.30	2.30	2.25	2.15	2.15	2.10	2.05	2.00	2.00	1.95	1.90
1929	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.50	2.45	2.40	2.40
1928	2.50	2.60	2.65	2.60	2.60	2.60	2.55	2.55	2.55	2.55	2.55	2.65
1927	2.65	2.60	2.55	2.55	2.50	2.55	2.55	2.55	2.55	2.55	2.50	2.50
1926	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65	2.65

Bar Iron, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c
1934	1.60	1.60	1.60	1.60	1.75	1.80	1.77	1.75	1.75	1.75	1.75	1.75
1933	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65	*1.60	1.60	1.60	1.60
1932	1.60	1.70	1.70	1.70	1.65	1.65	1.65	1.65	1.65	1.65	1.65	1.65
1931	1.70	1.75	1.70	1.80	1.80	1.70	1.70	1.70	1.70	1.70	1.65	1.60
1930	2.00	1.95	1.95	1.95	1.90	1.90	1.90	1.80	1.75	1.75	1.70	1.70
1929	2.00	2.05	2.00	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.00	2.00
1928	1.90	1.95	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
1927	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.90	1.85	1.90
1926	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

*Beginning September, Terre Haute, Ind., base quoted, freight to Chicago, 18 cents.

Rail Steel Bars, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c	1.75c
1934	1.70	1.70	1.70	1.79	1.85	1.85	1.77	1.75	1.75	1.75	1.75	1.75
1933	1.50	1.45	1.45	1.45	1.50	1.50	1.50	1.50	1.60	1.70	1.70	1.70
1932	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
1931	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.50	1.50	1.50
1930	1.85	1.85	1.85	1.85	1.80	1.75	1.75	1.65	1.65	1.65	1.65	1.65
1929	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.95	1.90
1928	1.80	1.80	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.90	1.95	2.00
1927	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.80	1.80	1.80
1926	2.00	2.00	2.00	2.00	2.00	1.90	2.00	2.00	2.00	2.00	2.00	2.00

Tie Plates, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c	1.90c
1934	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
1933	1.75	1.75	1.75	1.75	1.75	1.75	1.80	1.80	1.80	1.80	1.80	1.80
1932	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.85	1.75	1.75	1.75
1931	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90
1930	2.10	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.05	2.00	1.95
1929	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
1928	2.25	2.25	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15
1927	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.25	2.25
1926	2.30	2.25	2.25	2.25	2.25	2.25	2.25	2.30	2.35	2.35	2.35	2.35

Railroad Spikes, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.40c	2.60c
1934	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40
1933	2.40	2.40	2.25	2.25	2.15	2.15	2.40	2.40	2.40	2.40	2.40	2.40
1932	2.60	2.60	2.60	2.60	2.60	2.60	2.60*	2.60	2.60	2.40	2.40	2.40
1931	2.80	2.80	2.80	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.65
1930	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
1929	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
1928	2.70	2.75	2.75	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
1927	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.80
1926	2.80	2.80	2.80	2.80	2.80	2.80	2.80	2.75	2.80	2.80	2.80	2.80

Angle Bars, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c	2.55c
1934	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
1933	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
1932	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.65	2.65
1931	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1930	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1929	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1928	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1927	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75
1926	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75

Track Bolts, Chicago

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	3.55c	3.55c	3.55c	3.55c	3.55c	3.55c	3.55c	3.55c	3.55c	3.55c	3.55c	3.60c
1934	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55
1933	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.40	3.40	3.40	3.45	3.45
1932	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1931	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.70
1930	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
1929	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
1928	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
1927	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.80	3.80	3.80
1926	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90

Structural Rivets, Pittsburgh

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c	2.90c
1934	2.75	2.75	2.75	2.90	3.00	3.00	2.95	2.90	2.90	2.90	2.90	2.90
1933	2.25	2.25	2.25	2.25	2.25	2.35	2.50	2.50	2.50	2.60	2.75	2.75
1932	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
1931	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.55	2.30	2.25	2.25
1930	3.10	3.10	3.10	3.10	3.00	2.90	2.90	2.75	2.75	2.75	2.75	2.75
1929	2.85	2.90	2.95	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10
1928	2.75	2.75	2.80	2.90	2.90	2.90	2.90	2.85	2.80	2.80	2.80	2.80
1927	2.35	2.30	2.30	2.75	2.75	2.75	2.75	2.85	2.85	2.75	2.75	2.75
1926	2.55	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50

Cast Iron Pipe, New York

6-Inch and Larger

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$42.00	$42.00	$42.00	$42.25	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00	$43.00
1934	40.00	40.00	40.00	40.00	40.00	40.50	42.00	42.00	42.00	42.00	42.00	42.00
1933	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	34.00	34.50	38.60	40.00
1932	28.00	28.00	28.00	28.00	28.00	26.50	26.00	30.00	32.00	32.00	32.00	32.00
1931	38.10	37.50	37.50	37.50	37.75	34.50	33.70	32.00	28.50	29.10	29.00	28.00
1930	36.90	38.50	38.50	38.50	38.50	38.50	38.50	38.50	38.50	38.50	38.50	38.50
1929	38.85	39.80	39.80	39.05	38.20	38.00	37.90	37.50	37.50	37.50	36.75	36.50
1928	37.15	36.75	36.75	37.25	37.65	38.25	28.08	37.60	37.60	37.10	37.20	38.60
1927	49.50	49.50	49.50	49.50	48.60	47.95	46.00	44.00	38.25	36.90	37.25	37.25
1926	51.50	51.50	51.50	52.75	51.50	51.50	51.50	51.50	51.50	51.50	51.50	51.50

Cast Iron Pipe, Birmingham

6-Inch and Larger

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$38.00	$38.00	$38.00	$38.50	$39.00	$39.00	$39.00	$39.00	$39.00	$39.00	$39.00	$39.00
1934	36.00	36.00	36.00	36.00	36.00	36.40	38.00	38.00	38.00	38.00	38.00	38.00
1933	32.00	32.00	32.00	32.00	32.00	34.25	35.00	35.00	35.00	35.00	35.25	36.00
1932	33.00	32.20	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
1931	37.00	37.00	36.50	35.00	35.00	35.00	35.00	35.00	33.00	33.00	33.00	33.00
1930	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1929	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
1928	29.00	29.00	28.50	30.00	33.50	31.00	32.50	34.00	34.00	35.00	36.40	37.00
1927	36.00	36.00	36.50	36.00	36.50	34.80	34.00	30.75	29.80	28.75	29.00	29.00
1926	42.00	41.25	40.25	40.00	50.00	40.00	40.00	40.00	39.40	40.00	39.00	38.00

Cast Iron Pipe, Chicago

6-Inch and Larger

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1935	$46.00	$46.00	$46.00	$46.70	$47.40	$47.40	$47.40	$47.40	$47.40	$47.40	$47.40	$47.40
1934	44.00	44.00	44.00	44.00	44.00	44.80	46.00	46.00	46.00	46.00	46.00	46.00
1933	40.40	40.40	40.40	40.40	40.40	42.65	43.40	43.40	43.40	43.00	43.25	44.00
1932	40.40	38.80	38.40	34.40	34.40	34.40	34.40	34.40	38.90	40.40	40.40	40.00
1931	45.20	45.20	43.70	42.10	42.20	42.00	42.00	39.00	40.00	40.00	40.00	40.00
1930	44.40	45.20	45.20	45.20	44.00	43.20	44.80	45.20	45.20	45.20	45.20	45.20
1929	45.20	45.20	45.20	45.20	45.20	45.20	45.20	45.20	45.20	45.20	45.20	45.20
1928	36.20	36.20	36.70	38.20	39.00	39.00	41.45	42.00	42.20	42.70	45.00	45.20
1927	45.70	43.70	44.00	44.20	43.20	42.80	42.20	38.95	36.20	34.30	35.30	35.30
1926	48.70	49.20	49.20	49.20	49.45	48.95	47.45	47.45	47.80	47.20	47.20	47.20

IRON AND STEEL COMPOSITE

An unweighted average of per-ton quotations on 25 iron and steel products, including 5 pig iron, 5 scrap, 3 semifinished steel and 12 finished steel products

1930

Monthly averages

January	$35.19
February	34.92
March	34.79
April	34.16
May	33.49
June	33.28
July	33.00
August	32.90
September	32.76
October	32.35
November	31.95
December	31.69
Average for Year	33.37

1931

Jan. 7	$31.63
14	31.71
21	31.72
28	31.70
Average for January	31.69
Feb. 4	31.66
11	31.66
18	31.62
25	31.61
Average for February	31.64
Mar. 4	31.60
11	31.61
18	31.72
25	31.65
Average for March	31.65
April 1	31.59
8	31.59
15	31.50
22	31.34
29	31.33
Average for April	31.47
May 6	31.21
13	31.00
20	30.98
27	31.09
Average for May	31.07
June 3	30.85
10	30.84
17	30.82
24	30.76
Average for June	30.82
July 1	30.78
8	30.85
15	30.79
22	30.76
29	30.75
Average for July	30.78
Aug. 5	30.75
12	30.75
19	30.74
26	30.69
Average for August	30.73
Sept. 2	30.62
9	30.63
16	30.61
23	30.60
30	30.61
Average for September	30.61
Oct. 5	30.39
10	30.33
17	30.30
24	30.26
31	30.21
Average for October	30.30
Nov. 7	30.20
14	30.20
21	30.17
28	30.08
Average for November	30.16
Dec. 5	30.00
12	29.97
19	29.89
26	29.74
Average for December	29.90
Average for year	30.60

1932

Jan. 2	29.60
9	29.56
16	29.76
23	29.70
30	29.62
Average for January	29.65
Feb. 6	29.25
13	29.24
20	29.24
27	29.22
Average for February	29.24
Mar. 5	29.23
12	29.23
19	29.21
26	29.45
Average for March	29.28
April 2	29.47
9	29.41
16	29.40
23	29.46
30	29.45
Average for April	29.44
May 7	29.39
14	29.36
21	29.29
28	29.30
Average for May	29.34
June 4	29.20
11	29.12
18	29.08
25	28.97
Average for June	29.09
July 2	28.95
9	28.91
16	28.83
23	28.83
30	28.83
Average for July	28.87
Aug. 6	28.67
13	28.76
20	28.81
27	28.84
Average for August	28.77
Sept. 3	28.90
10	28.91
17	28.96
24	28.96
Average for September	28.93
Oct. 1	28.97
8	28.97
15	28.96
22	28.81
29	28.79
Average for October	28.90
Nov. 5	28.81
12	28.80
19	28.77
26	28.77
Average for November	28.79
Dec. 3	28.32
10	28.28
17	28.26
24	28.26
31	28.26
Average for December	28.28
Average for year	29.05

1933

Jan. 7	$28.26
14	28.27
21	28.08
28	28.08
Average for January	28.17
Feb. 4	27.99
11	27.92
18	27.92
25	27.91
Average for February	27.94
Mar. 4	27.90
11	27.91
18	27.91
25	27.95
Average for March	27.92
April 1	27.71
8	27.74
15	27.77
22	27.80
29	27.90
Average for April	27.78
May 6	28.19
13	28.28
20	28.42
27	28.43
Average for May	28.33
June 3	28.46
10	28.75
17	28.77
24	28.85
Average for June	28.71
July 1	29.23
8	29.61
15	29.82
22	29.80
29	29.88
Average for July	29.67
Aug. 5	29.93
12	29.91
19	29.91
26	29.94
Average for August	29.92
Sept. 2	30.27
9	30.29
16	30.26
23	30.31
30	30.65
Average for September	30.36
Oct. 7	30.59
14	30.52
21	30.58
28	30.42
Average for October	30.53
Nov. 4	30.27
11	30.28
18	30.21
25	30.24
Average for November	30.25
Dec. 2	30.92
9	30.96
16	31.01
23	31.07
30	31.07
Average for December	31.01
Average for year	29.30

1934

Jan. 6	$31.10
13	31.13
20	31.17
27	31.20
Average for January	31.15
Feb. 3	31.21
10	31.30
17	31.33
24	31.34
Average for February	31.30
Mar. 3	31.36
10	31.43
17	31.42
24	31.34
31	31.34
Average for March	31.38
April 7	31.33
14	33.15
21	33.12
28	33.09
Average for April	32.67
May 5	33.03
12	33.00
19	32.94
26	32.89
Average for May	32.97
June 2	32.81
9	32.83
16	32.84
23	33.16
30	33.15
Average for June	32.96
July 7	32.38
14	32.33
21	32.28
28	32.28
Average for July	32.32
Aug. 4	32.28
11	32.23
18	32.23
25	32.22
Average for August	32.24
Sept. 1	32.17
8	32.17
15	32.14
22	32.13
29	32.13
Average for September	32.15
Oct. 6	32.09
13	32.09
20	32.09
27	32.12
Average for October	32.10
Nov. 3	32.13
10	32.13
17	32.15
24	32.18
Average for November	32.15
Dec. 1	32.22
8	32.25
15	32.44
22	32.46
29	32.46

1935

Jan. 5	$32.51
12	32.57
19	32.62
26	32.60
Average for January	32.58
Feb. 2	32.56
9	32.56
16	32.54
23	32.50
Average for February	32.54
Mar. 2	32.42
9	32.39
16	32.38
23	32.33
30	32.30
Average for March	32.36
April 6	32.27
13	32.27
20	32.31
27	32.30
Average for April	32.29
May 4	32.30
11	32.34
18	32.34
25	32.41
Average for May	32.35
June 1	32.43
8	32.45
15	32.41
22	32.40
29	32.39
Average for June	32.42
July 6	32.39
13	32.40
20	32.42
27	32.55
Average for July	32.44
Aug. 3	32.59
10	32.64
17	32.68
24	32.72
31	32.78
Average for August	32.68
Sept. 7	32.79
14	32.81
21	32.83
28	32.83
Average for September	32.82
Oct. 5	32.82
12	32.86
19	32.83
26	32.85
Average for October	32.84
Nov. 2	32.98
9	33.16
16	33.16
23	33.17
30	33.28
Average for November	33.15
Dec. 7	33.30
14	33.32

For remainder of December see current market section.

Pig Iron Production

Coke and Anthracite Iron in Gross Tons; Annual Statistics by American Iron and Steel Institute, Monthly Statistics by STEEL

Year	Tons	Year	Tons	Year	Tons	Year	Tons	Year	Tons	Year	Tons
1886	5,273,010	1891	7,702,906	1896	8,311,833	1901	15,494,913	1906	24,874,184	1911	23,370,871
1887	5,900,914	1892	8,619,379	1897	9,397,469	1902	17,431,138	1907	25,343,964	1912	29,379,912
1888	5,955,105	1893	6,737,713	1898	11,477,184	1903	17,503,568	1908	15,686,872	1913	30,626,171
1889	7,028,374	1894	6,434,966	1899	13,335,937	1904	16,157,504	1909	25,419,468	1914	23,068,320
1890	8,574,558	1895	9,220,967	1900	13,404,760	1905	22,639,452	1910	26,907,060	1915	29,620,061

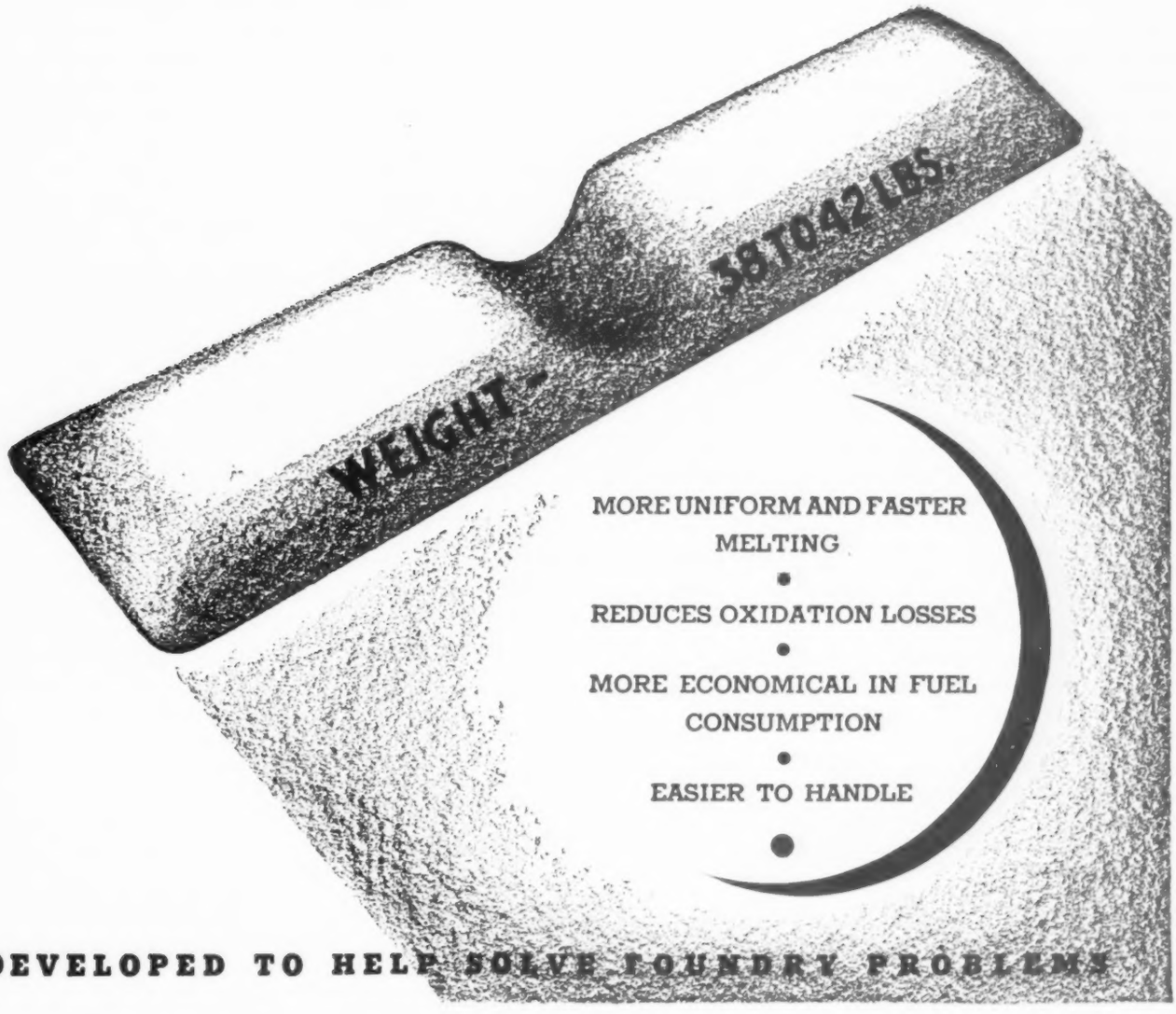
	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily
	1916				**1917**				**1918**				**1919**			
Jan.	421	304	3,171,878	102,319	422	310	3,159,839	101,930	435	294	2,403,227	77,523	435	330	3,306,279	106,654
Feb.	421	312	3,078,548	106,157	422	317	2,649,935	94,641	435	319	2,318,242	82,723	435	311	2,943,347	105,120
March	422	315	3,327,630	107,343	423	331	3,255,813	105,026	438	338	3,209,996	103,548	435	279	3,088,023	99,614
April	422	320	3,225,496	107,517	425	333	3,328,061	110,936	437	351	3,273,355	109,112	435	216	2,474,374	82,479
May	423	321	3,364,584	108,535	425	340	3,413,677	110,119	437	360	3,451,884	111,351	433	197	2,107,729	67,991
June	423	325	3,213,818	107,127	427	347	3,260,234	108,675	437	353	3,316,148	110,538	433	199	2,114,028	70,467
July	419	316	3,221,127	103,907	429	351	3,337,442	107,659	437	364	3,408,584	109,954	434	240	2,424,212	78,200
Aug.	419	317	3,197,838	103,156	431	357	3,238,970	104,483	438	371	3,378,479	108,983	432	266	2,742,081	88,453
Sept.	419	326	3,208,041	106,935	431	342	3,140,742	104,691	438	364	3,413,223	113,774	433	163	2,480,790	82,692
Oct.	419	328	3,508,180	113,167	433	354	3,296,286	106,332	437	364	3,482,392	112,335	432	216	1,864,424	60,142
Nov.	420	322	3,317,805	110,593	434	344	3,198,597	106,620	437	360	3,347,844	111,595	432	252	2,407,369	80,244
Dec.	422	309	3,184,178	102,715	435	321	2,885,380	93,077	435	351	3,434,114	110,778	432	262	2,626,074	84,711
Total			39,019,123	*106,609			38,164,976	*104,561			38,437,488	*105,308			30,578,730	*83,777
	1920				**1921**				**1922**				**1923**			
Jan.	432	285	3,012,373	97,172	436	184	2,414,753	77,895	430	127	1,645,804	53,090	428	261	3,228,226	104,136
Feb.	432	305	2,984,257	102,904	436	155	1,929,394	68,906	429	139	1,630,180	58,220	424	278	2,993,918	106,925
March	433	315	3,375,768	108,895	436	103	1,594,866	51,447	429	155	2,035,908	65,674	424	295	3,523,595	113,664
April	433	278	2,752,670	91,754	436	96	1,190,751	39,691	429	161	2,070,161	69,005	423	311	3,546,308	118,210
May	433	297	2,991,825	96,510	436	90	1,215,272	39,202	427	175	2,309,348	74,495	423	322	3,868,486	124,790
June	433	302	3,046,623	101,553	436	74	1,064,007	35,466	427	191	2,362,455	78,748	424	322	3,667,868	122,262
July	434	291	3,043,918	98,190	435	69	864,642	27,892	427	170	2,403,030	77,517	418	299	3,684,677	118,860
Aug.	434	306	3,145,536	101,468	436	69	954,901	30,802	427	143	1,810,665	58,408	418	270	3,448,886	111,254
Sept.	434	317	3,124,308	104,143	435	84	985,795	32,859	427	189	2,024,008	67,466	418	254	3,117,526	103,917
Oct.	435	290	3,288,341	106,075	435	95	1,234,450	39,821	428	218	2,629,655	84,827	418	245	3,142,646	101,375
Nov.	435	255	2,935,081	97,836	429	120	1,414,958	47,165	428	241	2,846,110	94,870	418	229	2,891,191	96,373
Dec.	435	202	2,700,268	87,105	429	123	1,642,775	52,992	428	253	3,083,520	99,468	418	231	2,912,527	93,952
Total			36,400,968	*99,456			16,506,564	*45,223			26,850,844	*73,563			40,025,850	*109,659
	1924				**1925**				**1926**				**1927**			
Jan.	414	248	3,015,480	97,273	411	251	3,372,207	108,781	385	225	3,319,789	107,089	369	210	3,101,346	100,043
Feb.	414	263	3,073,619	105,987	411	256	3,214,067	114,788	382	223	2,923,850	104,423	369	217	2,940,604	105,021
March	410	269	2,465,389	111,787	410	246	3,571,422	115,207	377	235	3,458,171	111,554	365	223	3,482,107	112,326
April	410	234	3,226,107	107,537	409	221	3,211,235	107,041	376	237	3,438,805	114,627	364	221	3,424,377	114,146
May	411	187	2,619,986	84,515	405	196	2,933,907	94,642	376	229	3,477,820	112,187	363	211	3,391,067	109,388
June	411	158	2,022,836	67 427	399	191	2,679,045	89,301	372	220	3,232,478	107,749	362	198	3,089,726	102,991
July	411	145	1,783,457	57,531	396	188	2,665,262	85,976	372	217	3,224,663	104,021	362	190	2,954,625	95,311
Aug.	411	150	1,882,986	60,741	391	192	2,707,171	87,328	372	215	3,200,723	103,249	362	189	2,950,674	95,183
Sept.	411	174	2,053,617	68,454	387	200	2,725,885	90,862	372	216	3,163,269	105,442	362	181	2,782,500	92,750
Oct.	411	182	2,461,727	79,410	386	209	3,017,889	97,351	374	218	3,334,206	107,555	361	174	2,812,015	90,712
Nov.	411	204	2,514,979	83,832	385	220	3,023,257	100,775	375	216	3,237,992	107,933	359	171	2,661,863	88,728
Dec.	411	229	2,956,389	95,367	385	234	3,249,057	104,808	369	203	3,089,175	99,651	354	169	2,698,208	87,039
Total			31,076,572	*84,908			36,370,404	*99,645			39,100,941	*107,126			36,289,112	*99,422
	1928				**1929**				**1930**				**1931**			
Jan.	353	184	2,855,515	92,113	328	202	3,433,028	110,742	314	173	2,838,751	91,573	309	102	1,715,443	55,337
Feb.	353	186	2,898,668	99,954	326	208	3,218,376	114,942	314	180	2,845,937	101,640	307	109	1,711,192	61,114
March	350	197	3,199,175	103,199	326	213	3,709,518	119,662	314	184	3,252,822	104,930	307	116	2,028,906	65,448
April	349	195	3,181,975	106,066	326	216	3,663,167	122,106	314	182	3,191,119	106,371	307	113	2,009,582	66,986
May	345	199	3,292,790	106,219	325	220	3,898,344	125,753	314	180	3,241,477	104,564	307	105	1,995,001	64,355
June	343	189	3,082,340	102,745	325	220	3,715,104	123,837	312	162	2,934,508	97,817	303	91	1,637,998	54,599
July	342	185	3,072,711	99,120	325	217	3,782,511	122,016	312	144	2,638,441	85,110	303	82	1,462,270	47,170
Aug.	340	183	3,136,995	101,193	325	209	3,746,198	120,845	312	137	2,525,105	81,455	303	75	1,279,205	41,264
Sept.	340	194	3,063,593	102,120	323	204	3,496,454	116,548	310	126	2,276,781	75,893	303	74	1,168,436	38,947
Oct.	338	196	3,373,539	108,824	318	203	3,588,146	115,747	310	111	2,165,374	69,851	303	69	1,172,781	37,831
Nov.	337	194	3,304,656	110,155	317	176	3,182,420	106,081	310	107	1,865,458	62,182	302	67	1,101,820	36,727
Dec.	335	198	3,369,784	108,702	316	156	2,836,917	91,513	310	95	1,665,715	53,732	301	57	980,377	31,625
Total			37,831,741	*103,365			42,270,183	*115,808			31,441,488	*86,141			18,263,911	*50,035
	1932				**1933**				**1934**				**1935**			
Jan.	298	61	971,437	31,336	291	45	568,785	18,348	289	86	1,225,643	39,537	281	89	1,478,443	47,692
Feb.	298	64	960,550	33,122	291	44	553,067	19,752	289	90	1,270,792	45,385	281	96	1,614,905	57,675
March	298	60	967,015	31,194	291	38	542,013	17,484	289	97	1,625,588	52,438	280	97	1,770,990	57,120
April	297	59	855,734	28,524	291	48	623,606	20,786	285	109	1,736,217	57,873	278	97	1,671,556	55,719
May	297	54	783,769	25,282	290	61	892,326	28,784	284	117	2,057,471	66,370	275	96	1,735,577	55,986
June	297	47	626,015	20,867	289	90	1,264,953	42,165	283	92	1,936,897	64,563	272	91	1,558,463	51,949
July	297	45	570,222	18,394	289	105	1,801,345	58,108	282	74	1,228,544	39,630	270	92	1,520,340	49,043
Aug.	297	41	528,105	17,035	289	98	1,833,265	59,137	282	61	1,060,187	34,199	270	98	1,759,782	56,767
Sept.	295	46	593,640	19,788	289	89	1,507,931	50,264	282	61	899,075	29,969	270	104	1,770,259	59,009
Oct.	292	50	644,648	20,795	289	81	1,358,540	43,824	282	65	951,353	30,689	269	116	1,978,379	63,818
Nov.	292	51	625,753	20,858	289	77	1,083,740	36,124	281	60	957,906	31,930	268	112	2,066,293	68,876
Dec.	291	42	547,179	17,650	289	74	1,192,136	38,456	281	67	1,028,006	33,161	See Market Section			
Total			8,674,067	*23,699			13,221,707	*36,223			15,977,679	*43,774			†18,924,987	*56,662

*Average. †Eleven months.

MELTRITE PIG IRON

FEDERAL IROQUOIS PERRY TOLEDO ZENITH

A *Smaller* PIG FOR *Better* MELTING



DEVELOPED TO HELP SOLVE FOUNDRY PROBLEMS

PICKANDS MATHER AND COMPANY

CLEVELAND CHICAGO DETROIT ERIE TOLEDO MINNEAPOLIS DULUTH

SIGNS OF PARTIAL ECONOMIC RECOVERY APPEARING IN EUROPE

BY VINCENT DELPORT
European Manager, STEEL

WITH Great Britain leading, Europe has achieved some measure of success in economic recovery during 1935, and this improvement was reflected in increased activities of the steel industries in most producing nations. The increase of 14.8 per cent in European steel production is commented upon elsewhere in this issue, but the point that we wish to emphasize here is, that the rate of increase tended to accelerate as the year came to an end, even in those countries which had lagged behind. This is a good omen for the coming year.

Almost without a break, from the beginning to the end of the past year British industry advanced by increasing strides and finally attained an all-time record for its steel output. The reorganization of the British steel industry, which was a condition imposed by the government when import duties were granted to protect the home trade, made considerable progress and culminated in the last days of November with the registration of the British Iron and Steel corporation, which now controls exports and imports of iron and steel to and from the continent. One of the most important events of the year was the agreement arrived at between the British Iron and Steel federation and the European steel cartel, which materialized in June. This agreement completes the organization of the steel export trade over the whole of Europe and is the result of several years of difficult negotiations. It adds protection to the British market by limiting imports of continental steel products to a level substantially below the average annual tonnage imported in the past; it is intended to divide export markets methodically between members of the entente in order to reduce ruinous competition, and it is expected to have the effect of raising export prices to a profitable level in favor of all parties concerned.

There are still many points of detail to settle between Great Britain and the continental members of the entente, but it is felt that the greatest difficuties have been overcome. The main provisions of the agreement have been in operation since August, 1935, and have worked satisfactorily.

Negotiations are still being carried on between the entente and central European countries, and when these have materialized, it is hoped that a new era will have opened up for the European steel industry.

As the new year starts upon its course, the prospects of the British steel industry are bright. Prices were stable during 1935, and any advances were gradual. At the same time, it is hoped that the measures taken to reorganize the industry, and the more economical operation of works operating almost to capacity, will combine to reduce production costs. Already a number of concerns are showing results which promise a substantial margin of profit at the end of the financial year. Among the continental countries, Germany made considerable progress and also benefited from the return of the Saar, which is an important steel-produc-

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ing district. Germany has now attained first rank in Europe as a producer of iron and steel. Domestic trade was active, prices remained stable throughout the year and export trade improved, while imports diminished.

On the other hand, Germany is still handicapped by her need for foreign exchange to finance the importation of the raw materials she lacks. This situation is being met by various measures, some of which are of a drastic character and force the people to accept a certain amount of hardship, but the outlook today appears at least as promising as a year ago.

Again France experienced a year of depression, and no marked improvement could be seen over the conditions prevailing throughout 1934. It is true that a little more activity was noticeable as the past year drew to a close, but the outlook remains uncertain, owing to development of the political situation, which has a considerable influence on production and trade in that country.

Until a strong government, with a strong majority in parliament, and a constructive program, can come into control, that confidence necessary to progress will be sadly lacking.

France has seen her exports of iron and steel considerably reduced during 1935: this, according to the annual report of a leading steel concern, is due more particularly to the difficulties experienced in the transfer of exchange due to the closing of France to imports of produce from steel-consuming countries which were previously good clients of the French steelworks.

Other steel-exporting countries, especially Belgium and Luxemburg, have striven hard to meet the ever-increasing competition in foreign markets. These two countries have also seen their exports to Britain seriously and definitely curtailed. There was some progress, however, in other directions, owing to increasing consumption of steel products in overseas markets.

The past year has again shown that the international steel trade is undergoing a period of evolution. Countries that were large importers several years ago have increased their productive capacity and are gradually becoming self-contained. A few of these countries are themselves endeavoring, and not without success, to capture their own share of remaining export markets, and the year was featured in this respect by the first substantial exports of pig iron from Russia.

European Iron and Steel Export Prices, 1935

F. O. B. Ports of Shipment

British Prices in Pounds Sterling per Gross Ton, at Current Rate of Exchange

	Jan. £ s d	Feb. £ s d	March £ s d	April £ s d	May £ s d	June £ s d	July £ s d	Aug. £ s d	Sept. £ s d	Oct. £ s d	Nov. £ s d	Dec. £ s d
PIG IRON												
Foundry, No. 3, Middlesbrough	3- 1-6	3- 1-6	3- 2-0	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6
Basic, Middlesbrough	2-15-0	2-15-0	3- 0-0	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6	3- 2-6
Hematite, East Coast	3- 2-0	3- 2-0	3- 2-0	3- 2-0	3- 3-0	3- 3-0	3- 4-0	3- 5-0	3- 5-0	3- 5-0	3- 5-0	3- 5-0
SEMI-FINISHED STEEL												
Billets	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0
Wire rods	7-16-0	7-16-0	7-16-0	8- 3-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0
FINISHED STEEL												
Standard rails	7-15-0	7-15-0	7-15-0	7-15-0	7-15-0	7-15-0	7-15-0	7-15-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0
Merchant bars	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0	7-10-0
Structural shapes	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 7-6	7- 8-9	7-10-0
Plates, ship, bridge and tank	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 0-0	8- 1-3
Sheets, black, 24-gage	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 7-6	9-10-0	9-10-0
Sheets, galvanized, 24-gage, corrugated	11- 5-0	11- 5-0	11- 5-0	11- 5-0	11- 5-0	11- 5-0	11- 5-0	11- 5-0	11- 5-0	11- 7-6	11-10-0	11-10-0
Hoops and bands	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0	8-10-0
Plain wire, base	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0
Galvanized wire, base	11- 5-0	11- 5-0	11- 5-0	11- 5-0	10-15-0	10-15-0	10-15-0	10-15-0	10-15-0	10-15-0	10-15-0	10-15-0
Wire nails, base	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0	12- 0-0
Tinplate, base box 108 pounds	0-18-2	0-18-2	0-18-2	0-18-2	0-18-2	0-18-2	0-18-2	0-18-2	0-18-2	0-18-5	0-18-9	0-18-9
Ferromanganese, delivered Atlantic seaboard, duty-paid	$85	$85	$85	$85	$85	$85	$85	$85	$85	$85	$85	$85

Continental Prices in Gold Pounds per Metric Ton

F. O. B. Channel or Northern Seaports

	Jan. £ s d	Feb. £ s d	March £ s d	April £ s d	May £ s d	June £ s d	July £ s d	Aug. £ s d	Sept. £ s d	Oct. £ s d	Nov. £ s d	Dec. £ s d
PIG IRON												
Foundry, Silicon 2.50-3.00	1-14-0	1-15-0	1-14-0	1-14-0	1-14-0	1-14-0	1-14-0	1-14-6	1-15-0	1-15-0	1-15-0	1-16-0
Basic bessemer	1-12-0	1-13-0	1-12-0	1-12-0	1-12-0	1-12-0	1-12-0	1-12-0	1-12-0	1-12-0	1-12-0	1-12-0
SEMI-FINISHED STEEL												
Billets	2- 7-0	2- 7-0	2- 7-0	2- 7-0	2- 7-0	2- 7-0	2- 7-0	2- 7-0	2- 7-0	2-7 -0	2- 7-0	2- 7-0
Wire rods	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0	4-10-0
FINISHED STEEL												
Standard rails	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0
Merchant bars	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9	3- 3-9
Structural shapes	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6	3- 1-6
Plates, 5 millimeters	4- 2-6	4- 2-6	4- 2-6	4- 2-6	4- 2-6	4- 2-6	4- 3-9	4- 5-0	4- 5-0	4- 5-0	4- 5-0	4- 5-0
Sheets, black, 24-gage, close annealed	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0	5-16-0
Sheets, galvanized, 24-gage, corrugated	6-10-0	6-10-0	6- 7-6	6-10-0	6- 7-6	6- 7-6	6- 7-6	6- 5-0	6- 5-0	6- 5-0	6- 4-0	6- 0-0
Hoops and bands	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0	4- 0-0
Plain wire, base	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0	5- 5-0
Galvanized wire, base	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6	5-17-6
Wire nails, base	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0	4-15-0

British Steel Trade Makes Substantial Upward Progress

BY J. A. HORTON,
British Correspondent, STEEL

OUTSTANDING in the history of British iron and steel in 1935 ranks the five-year agreement reached between the British Iron and Steel federation and the international steel cartel. The important issues involved are such that subsequent development of British trade must be judged in the light of the new arrangements.

Under the scheme it was decided, among other matters, to limit the quantities of continental material coming into Britain. In the twelve months commencing Aug. 8 the total imports from cartel countries are not to exceed 670,000 tons, and for the four successive years thereafter are not to exceed 525,000 tons a year.

New Problems Being Met

The agreement is also subject to import duties on the products included therein being reduced to a level not exceeding 20 per cent ad valorem. The parties set up a coordinating or management committee to be responsible for the agreement, and in the few months that have elapsed it seems to have worked smoothly. Nevertheless, it has brought problems in its train, notable among them being the shortage of soft steel billets.

Negotiations for some understanding with the continent proceeded over a considerable period, and importers took advantage of the time by buying heavily. Thus, when signing of the final agreement came in August there were heavy stocks of imported steel in British works and warehouses. These supplies having been exhausted in the autumn, the onus of providing sufficient billets for steel rerollers fell upon British works.

They have not been able to satisfy the demand, and in response to urgent representations of rerollers in the Midlands and elsewhere, the British Iron and Steel federation made special arrangements to secure continental billets to prevent the dislocation of business due to the shortage. This indicates but one side of the picture.

On the other must be put the increase of confidence and the feeling of satisfaction which has been evident throughout British trade in the last half of 1935. The volume of business transacted by steel producers is unquestionably on the increase, and steel production is heading for a new record. As an example of what is happening under the tariff arrangement, the following is of interest.

A Midland firm of importers of bright steel strip, taking as much as 5000 tons a year, commenced cold-rolling for itself in June, 1932: it has since worked day and night to keep pace with orders, and in 1935 the same firm decided to put down its own plant in the form of a hot-rolling mill for strip from 2 to 15 inches in width. The number of men employed at these works is expected to increase rapidly.

In a market largely controlled there has been practically no movement in prices of steel. Steelmakers, moreover, desired to refrain from taking any step which might interfere with the recovery of trade which began in 1934 and grew steadily in 1935. Thus, it comes about that the scale fixed by the Steel association in 1929 is still in force in the British domestic market.

It would be unwise to prophesy for the future, but the tendency is decidedly in the direction of an increase in heavy steel prices. Galvanized and black sheets have already been advanced, and scrap values have increased considerably during the last few months. Various factors have contributed to higher costs of production.

All Factors Show Improvement

An important consideration is that of railway rates. Notice has been given of the withdrawal of the special rebates granted to the steel trade on raw materials, these concessions having been allowed when the industry was considered as a depressed industry. If the rebates are withheld, costs will go up three or four shillings a ton on pig iron, with a proportionately larger amount on steel.

Customers' requirements are undoubtedly expanding. The automobile industry, despite the introduction of restrictive legislation, has had a successful year, and leading manufacturers are budgeting for supplies of steel on a larger scale than ever. In structural engineering there is abundant evidence of expansion in specifications for heavy steel. The all-round improvement in British industry is giving a stimulus which is reflected in various ways, not least being the urgent necessity of enlarging old factory premises, or replacing them with modern steel structures.

The increase in output of steel has been one of the features of the year of revival. In October the peak was reached with 907,300 tons, nearly 300,000 tons more than in January and the highest monthly total since March, 1927. The full significance of this may be realized when it is compared with the 1913 average of 638,600 tons and the 1934 average of something like 744,000 tons. The total for the first ten months was 8,127,600 tons, against 7,439,200 tons in the corresponding period of 1934, an increase of 9.2 per cent. Certain districts in the steel trade are operating to full capacity, but, taking the country as a whole, present production is equivalent to 85 per cent of steel-making capacity. The volume of business in hand is

British Business Progress in 1935

Gross tons 000 omitted)

Mo. ave.	PRODUCTION Coal	Pig iron and ferro-alloys	No. fur-naces in blast	Steel ingots and castings	IMPORTS Iron ore	Pig iron and ferro-alloys	Steel†	EXPORTS Furnace coke	Pig iron and ferro-alloys	Steel†
1913.....	23,951	855	338	639	603	18.0	168	...	93.7	320
1932.....	17,394	298	60	438	147	12.8	120	114	10.7	147
1933.....	17,259	345	81	585	226	10.2	71	123	9.3	151
1934.....	18,413	498	96	738	363	13.6	100	115	11.1	177
1935										
Jan.....	20,519	521	94	758	343	9.8	121	148	14.0	167
Feb.....	18,314	483	97	770	347	10.6	93	128	11.8	161
March.....	19,284	554	97	842	335	16.2	110	121	8.2	168
April.....	17,581	526	96	809	383	8.0	55	84	20.2	191
May.....	19,280	559	97	853	440	10.2	76	98	17.8	196
June.....	16,138	529	97	770	362	11.6	87	83	11.2	184
July.....	17,441	547	98	803	427	8.5	82	131	13.0	193
Aug.....	16,895	543	98	760	373	12.2	62	156	12.1	190
Sept.....	17,722	530	97	856	430	9.6	80	161	12.9	174
Oct.....	19,834	544	99	907	345	9.5	92	192	14.7	209
Mo. ave....	18,301	534	...	813	378	10.6	86	130	13.6	183

*Average for 1913; on last day of year or month for subsequent figures.
†Includes iron castings, but scrap excluded.

sufficient to justify the belief that this high level will be maintained for some time.

Official figures issued by the board of trade indicate a moderate rise in prices during 1935, due to ore, coke and scrap.

As compared with 1934, the number of furnaces in blast did not change materially, and production remained fairly constant. The highest level was touched in May with 558,900 tons.

It has been necessary to start a new furnace in South Staffordshire, a district which at one time was famed for its pig iron industry, although now there are only a few furnaces remaining. Two new furnaces have been kindled in Northamptonshire, one to make foundry iron and the other basic iron.

Reorganization is in progress throughout the industry. During the last three years, upward of 200 millions sterling has either been expended or authorized on the modernization of existing plant and the installation of new plant and equipment.

Shipbuilding firms have been greatly encouraged by the volume of work under contract and in prospect. In October it was estimated that contracts booked by Clyde shipbuilders ran to five millions sterling. Some of these orders, it is suggested, have been hastened by the knowledge that the yards are likely to be busier in the near future on warship construction, but apart from that there is little doubt that the shipbuilding industry is improving, a favorable sign being the upturn in freight rates.

With the national government returned to power by a strong majority, it is more than likely that naval replacement schemes will be taken in hand, thus finding increased employment for steelmakers and shipbuilders on the Clyde and the North East coast.

Despite the revival elsewhere, South Wales has been one of the most distressed areas in the country. The possibility of the reopening of the Ebbw Vale iron and steel works is, therefore, of more than ordinary encouragement. Richard Thomas & Co. Ltd. has decided to take over the Ebbw Vale company's works, to retain the modern blast furnaces erected at a cost of over a million sterling to "win the war," but not completed until afterwards, and en-

(*Please turn to Page* 285)

European Iron and Steel Domestic Prices, 1935

At Works or Furnace

British Prices in Pounds Sterling per Gross Ton, at Current Rate of Exchange

	Jan. £ s d	Feb. £ s d	March £ s d	April £ s d	May £ s d	June £ s d	July £ s d	Aug. £ s d	Sept. £ s d	Oct. £ s d	Nov. £ s d	Dec. £ s d
Foundry pig iron, Silicon 2.50-3.00*	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 8-9	3-10-0
Basic pig iron*	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 7-6	3- 8-9	3-10-0	3-10-0	3-10-0	3-10-0	3-10-0	3-10-0
Furnace coke	0-17-6	0-17-6	0-16-6	0-16-6	0-16-6	0-16-6	0-16-6	0-16-6	0-16-6	0-17-0	0-17-6	0-18-6
Billets	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0	5-10-0
Standard rails	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0	8- 5-0
Merchant bars	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0	8-12-0
Shapes†	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0	8-15-0
Plates, ship, bridge and tank†	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3	9- 1-3
Sheets, black, 24-gage	10-10-0	10-10-0	10-10-0	10-10-0	10-10-0	10-10-0	10-15-0	11- 0-0	11- 0-0	11- 0-0	11- 5-0	11- 5-0
Sheets, galvanized, 24-gage, corrugated	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 0-0	13- 2-6	13- 5-0	13- 5-0
Plain wire	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0	9- 5-0
Hoops and bands	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0	9- 7-0

*Delivered Middlesbrough.

†Rebates of 15s. per ton for shapes and plates, and 22s. 6d. for beams, are obtainable in the home trade when the purchaser undertakes to buy only British steel.

German Prices in Reichsmarks per Metric Ton

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Foundry pig iron, Silicon 2.50-3.00	63	63	63	63	63	63	63	63	63	63	63	63
Hematite pig iron	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
Furnace coke	19	19	19	19	19	19	19	19	19	19	19	19
Billets	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50	96.50
Standard rails	132	132	132	132	132	132	132	132	132	132	132	132
Merchant bars	110	110	110	110	110	110	110	110	110	110	110	110
Shapes	107.50	107.50	107.50	107.50	107.50	107.50	107.50	107.50	107.50	107.50	107.50	107.50
Plates, 5 millimeters	127	127	127	127	127	127	127	127	127	127	127	127
Sheets, black, 1 to 3 millimeters, basis	144	144	144	144	144	144	144	144	144	144	144	144
Sheets, galvanized, 24-gage, corrugated	370	370	370	370	370	370	370	370	370	370	370	370
Plain wire	173	173	173	173	173	173	173	173	173	173	173	173
Hoops and bands	127	127	127	127	127	127	127	127	127	127	127	127

French Prices in French Francs per Metric Ton

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
Foundry pig iron, Silicon 2.50-3.00	210	260	260	260	260	260	260	260	260	260	260	260
Basic bessemer pig iron	185	185	185	185	185	190	190	190	190	190	190	190
Furnace coke	120	120	120	120	120	120	120	95	95	95	95	95
Billets	430	430	430	430	430	430	430	430	430	430	430	430
Standard rails	694	694	694	694	694	694	694	694	694	694	694	671
Merchant bars	560	560	560	560	560	560	560	560	560	560	560	560
Shapes	550	550	550	550	550	550	550	550	550	550	550	550
Plates, 5 millimeters	700	700	700	700	700	700	700	700	700	700	700	700
Sheets, black, 2 millimeters	850	850	850	850	700	655	620	620	620	600	595	575
Sheets, galvanized, 0.6-millimeter, corr.	1350	1350	1350	1350	1310	1270	1150	1075	1075	1075	1000	1000
Plain wire	1050	1050	1050	1050	1050	1050	1050	1050	1050	1050	1010	900
Hoops and bands	650	650	650	650	650	650	650	650	650	650	650	650

Belgian Prices in Belgian Francs per Metric Ton

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Foundry pig iron, Silicon 2.50-3.00	310	310	310	340	370	370	370	370	370	370	375	385
Basic bessemer pig iron	275	285	280	305	330	330	330	330	330	330	350	350
Furnace coke	110	110	110	110	115	115	115	115	115	115	115	115
Billets	440	440	440	440	540	540	540	540	540	540	540	540
Standard rails	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100	1100
Merchant bars	550	550	550	560	600	600	600	600	600	600	600	600
Shapes	550	550	550	560	600	600	600	600	600	600	600	600
Plates, 5 millimeters	700	700	700	710	750	700	700	700	700	700	700	700
Sheets, black, 1 to 3 millimeters, basis	775	775	775	785	825	825	825	825	825	825	825	825
Galvanized sheets, corrugated, 0.5-mill.	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
Plain wire	1100	1100	1100	1100	1100	1135	1150	1150	1150	1150	1150	1150
Hoops and bands	700	700	700	735	840	840	840	840	840	840	840	840

Lack of Confidence Still Hampers French Trade

BY LEON JAUDOIN
French Correspondent, STEEL

THE French steel industry started 1935 under a heavy cloud. At the beginning of the year there was a glimmer of hope that conditions might improve, but it cannot be said that this hope materialized.

The return of the Saar territory to Germany was one of the important events of the year. The result of the plebiscite had been anticipated and, in fact, the return to German control of the Saar iron and steel works did not react unfavorably on the French steel industry. Certain concerns which had standing agreements with Saar works have decided to build new works in order that they may now be able to act independently. Thus, the Acieries de la Marine has commenced the erection of a wire mill at Marnaval.

The main difficulty with which the French steelmakers had to contend was the high level of prices, which prevented them from meeting foreign competition in export markets, particularly as regards those steel products that are not controlled by syndicates, such as, for instance, special steels.

More War Material Made

This difficulty was increased by the devaluation of the Belgian franc at the end of March, which gave a further advantage to Belgian exporters. On the other hand, the failure of the disarmament conference and the consequent re-armament of Germany brought about considerable activities in steel products used for the manufacture of war material and defensive works. This is illustrated by the fact that for the construction of steel hangars for airplanes a tonnage of nearly 20,000 tons of steel was required. Similar developments occurred in respect of naval shipyards.

While these factors gave an impetus to the French steel industry, it is felt that the resulting revival in certain departments of the larger steelworks is not a healthy development, nor is it likely to offer any serious guarantee of permanency

France has been experiencing many political and economic difficulties. The Laval government, which came into power in the spring, made serious efforts to reduce the cost of living and increase the purchasing power of the people, and a small measure of success crowned the efforts of the government.

But those endeavors failed to revive confidence, because it was known that when the Chamber of Deputies would meet again at the end of the year, party strife would be renewed and the destinies of the Laval government would be in jeopardy; therefore, mainly for political reasons, the state of affairs at the end of the year was no brighter than it was at the beginning.

There was a considerable increase in the number of unemployed workers in France throughout the year, and the balance of trade remained negative. As a result of these unfavorable conditions, France was the only major country in Europe whose steel output did not show a marked increase in comparison with that of 1934, and during the first ten months the output of steel ingots and castings amounted to 5,187,000 metric tons, compared with 5,142,000 tons in the corresponding period of 1934.

The following figures give the output of a number of products that were controlled by the comptoirs, applying to the first nine months of the year: semifinished steel, 271,010 metric tons for the domestic market, 135,910 tons for export markets; shapes, 175,210 tons and 113,010 tons; profiles and bars, 542,090 tons and 98,080 tons; plates, 147,080 tons and 9580 tons; medium-gage sheets, 75,330 and 3510 tons.

In almost every case, both for domestic and export markets, these figures show a marked decrease in comparison with those for the corresponding period of the preceding year, the only exceptions being for the tonnage of profiles and bars, and also heavy plates, manufactured for the domestic market, which showed a slight increase in 1935.

French Exports Decline

The reduction in the manufacture of steel products for export is also reflected in the actual export figures. For the first nine months the exports of ingots, semifinished steel, rolling mill products, forgings and scrap from France totaled 1,733,500 metric tons, compared with 2,236,600 tons in the corresponding period of 1934, a decrease of 23 per cent.

There was a considerable decrease in exports from France to Germany, largely owing to the fact that before its return to Germany, the Saar territory was included in the French customs union, and contributed most of the French exports to the German market. There was also a substantial reduction in the exports of French steel products to Great Britain, due to the quota arrangement that was enforced in August.

During the year there were hardly any modifications in the level of wages paid to the iron and steel workers, and little trouble was experienced as regards strikes.

For the past few years a number of comptoirs or syndicates have controlled the tonnage of a number of steel products and also their selling price, these various syndicates being grouped under the Comptoir Siderurgique. The term of life of this comptoir expired in June.

As the date of its renewal was approaching, most of the works that were members of the comptoir were anxious to improve their relative positions, especially as regards their quotas of production. This rendered the negotia-

French Business Progress in 1935

(Metric tons 000 omitted)

Mo. ave.	PRODUCTION* Iron ore	Coke†	Pig iron and ferro-alloys	No. furnaces in blast‡	Steel ingots and castings	IMPORTS@ Coke	Pig iron and ferro-alloys	Steel§	EXPORTS@ Pig iron and ferro-alloys	Steel§
1913	3,588	336	756	195	581	256	4.2	10	9	51
1932	2,300	277	461	81	470	164	3.7	14	17	183
1933	2,520	320	527	91	544	187	8.1	17	15	208
1934	2,667	342	513	86	514	183	5.6	11	14	253
1935										
Jan.	2,819	351	512	85	495	194	6.0	10	9	272
Feb.	2,522	316	450	82	458	168	4.0	9	13	249
March	2,668	347	489	80	505	176	3.0	14	8	158
April	2,672	323	478	82	517	190	7.0	8	10	165
May	2,779	314	502	81	555	185	6.0	8	10	275
June	2,612	314	465	82	503	175	5.0	8	13	154
July	2,756	318	486	80	544	164	5.0	8	14	169
Aug.	2,673	316	479	80	537	163	4.0	13	10	147
Sept.	2,605	311	472	81	521	180	6.0	13	8	143
Oct.	2,752	326	490	82	552	167	4.0	10	25	154
Mo. ave.	2,686	324	482	82	519	176	4.8	10	12	189

*Production for 1913 is for France in her present boundaries.
†Coke production at the coal mines. In addition, the iron & steel works produce about 2,500,000 tons annually.
‡On last day of year, or month.
§Includes ingots, semifinished steel, all rolled products, forgings and scrap.
@Import & export figures are inclusive of the Saar district, except in 1913 & from Feb. 18, 1935.

tions for the renewal of the Comptoir Siderurgique and its subsidiary syndicates difficult, with the result that it was impossible to renew them at the time they came to expiration, and they were prorogued from time to time until the end of the year.

There was one exception, that of the light-sheet syndicate, which proved so difficult to control that it was broken up at the beginning of May, owing more especially to the exigencies of one member-firm. Immediately the light-gage sheet comptoir was out of existence, the basis price of sheets dropped by about 30 per cent, and, in fact, 2-millimeter sheets were sold lower than ¼-inch plates.

One of the principal difficulties encountered during the negotiations for the re-organization of the Comptoir Siderurgique was the proposal to submit all controversial questions arising among the members of the comptoir to a court of arbitration consisting of three members and which would make a final decision on such questions. A number of works refused to support this proposal, due to the particular circumstances under which they are working.

However, toward the end of the year all the French works except one agreed to the principle of arbitration, and it was only at the end of November that this last works gave its consent and that the Comptoir Siderurgique finally was renewed for five years, until Dec. 31, 1940. Under the clauses of the renewed comptoirs the various works manufacturing plates and sheets, bars and profiles are allowed to contract for business direct with their clients in the domestic market, within the limits of their quotas, and provided that they do not quote prices lower than those fixed by the syndicates controlling their products.

Political Situation Unsettled

The steel export syndicates, operating under control of the International Steel cartel, functioned satisfactorily and the reduction in export business referred to in connection with Germany and Great Britain was partly made up for by important contracts with the Union of Soviet Republics. Export prices, as fixed by the International Steel Cartel, showed little variation throughout the year.

The basis prices of representative products were as follows: basic bessemer steel billets, £2 7s (gold) per metric ton; merchant bars, £3 5s (gold); shapes £3 1s 6d (gold); ¼-inch plates, £4 2s 6d (gold). These are basic f.o.b. prices, and a rather complicated system of adjustment is made for the c.i.f. quotations in the various export markets of the world.

During the year there were few variations in domestic prices of those products controlled by syndicates. Billets were quoted at 430 francs per metric ton; shapes, 550 francs; merchant bars, 560 francs; wire rod, 715 francs; ¼-inch plates, 700 francs. The basis price of medium and light-gage sheets was 850 francs per metric ton for 2-millimeter sheets at the beginning of the year, but following the breaking up of the sheet syndicate, the price suddenly dropped to 620 francs, and actually fell as low as 550 francs.

Foundry pig iron was quoted at 210 francs at the beginning of the year, and in February was raised to 260 francs, at which point it remained until the end of the year. The price of hematite pig iron ranged from 310 to 350 francs, and that of ferromanganese from 700 to 750 francs.

As far as it is possible to make a forecast of conditions in the French steel industry in 1936, under the present confused situation, there is no doubt requirements of the domestic market are heavy, and existing stocks in most departments are below normal. This is the result of the restriction of buying brought about by the lack of confidence which has characterized conditions in France during the past year.

Once again it must be borne in mind that conditions in France depend to a considerable extent upon the political situation and there is, again, a considerable element of anxiety in the country owing to the fact that new parliamentary elections are due in the spring of 1936. The most favorable factor of the situation is the reorganization of the Comptoir Siderurgique, which at any rate will prevent uncontrolled competition and the lowering of prices to an uneconomic level.

Central Europe Forges Ahead; Russia Gains Much

BY DR. JAN TILLE,
Special Correspondent, STEEL

CONTINUED progress was the feature of the steel industry of Central Europe during 1935, with the consequence that all the works showed better results than in the previous year.

At the end of the year, the steelworks of Czechoslovakia were operating at over 50 per cent of capacity, but the rate of increase in raw steel production slackened a little. Production in 1935 was about 1,150,000 metric tons, compared with 952,617 tons in 1934. Exports of rolled products accounted for 22 per cent of the total output. Furthermore, about 10 per cent of the total production was taken up by the engineering industry for export purposes.

A special export premium is granted on such material, the fund for such premiums being contributed by the domestic trade. Exports to Russia were approximately the same as in 1934. A commercial treaty was concluded between Soviet Russia and Czechoslovakia, and deliveries now take place under a credit arrangement in which the Czechoslovak works and the banks co-operate.

Czechoslovakia has been a member of the international steel syndicate (EJA) since 1934 with respect to plates, medium-gage sheets and hoops and bands. Tin plate quotas have not yet been fixed by the international steel syndicate, but Czechoslovakia has undertaken to join this cartel.

Some changes have been made in the international rail-manufacturers association (IRMA). The Central-European group has been dissolved, and Hungary has become a separate member with a quota of 2.07 per cent. Czechoslovakia and Austria remain as joint members of IRMA as the Czechoslovak-Austrian group, with a quota of 3 per cent.

Prices in the home trade remained unchanged in 1935. Although currency difficulties, involving compensation, clearing, increased import duties and embargoes, etc., have not lessened, business with the Balkan countries increased beyond the previous year's figures. The prospects for the future are favorable.

The domestic turnover shows a rising tendency, especially in consideration of the increased capital expenditure planned by the Czechoslovak state railways. In export trade an increase is also to be expected.

Steel Production Increased

In Austria the production of raw steel in the first nine months was about 200,000 metric tons. The total production for the whole year is expected to reach about 300,000 tons, and the prospects for the coming year are favorable.

In Hungary an increase of steel production could also be observed. During the first nine months of 1935 a total of 172,000 metric tons was manufactured, against 120,000 tons in the same period of the preceding year. Austria and Hungary have not yet joined the international steel syndicate.

In the course of 1935 Poland be-

came a member of the international steel cartel and of the international railmakers association.

The trend of raw steel production in Russia continues upward, the increase during the past two years having been especially remarkable, as can be seen from the following figures: 1931: 5,416,000 metric tons; 1932: 5,900,000 tons; 1933: 6,750,000 tons; 1934: 9,900,000 tons. According to the figures available for the first eight months of 1935, the production for the whole year can be estimated at over 12,000,000 metric tons. This makes Russia the largest producer of raw steel in Europe, after Germany, and the third largest in the world.

Program Nearly Reached

The scheme of development which this industry had undertaken for 1935 has been realized to the extent of 75 per cent. The Soviet intends to continue this development until a production capacity of 25,000,000 tons per year is attained. The production of pig iron is to be increased proportionately. In consideration of the results already attained, it can be anticipated that their endeavors may be successful within the time limit of their plan.

Total imports of iron and steel into Russia show a further decrease. Imports from Poland and Germany suffered most, whereas France registered an increase: Russian orders placed in France in the second half of 1935 amounted to about 40,000 metric tons of rolled products. In 1935, Czechoslovakia exported to Russia about 21,600 tons of rolled products, mainly spring steel, and wheels and axles. The United Kingdom delivered 64,400 tons of rolled material to Soviet Russia in the first five months of 1935, a decline of over 4500 tons in comparison with the tonnage exported in the corresponding period of the preceding year. On the other hand, Russia is beginning to take a share in export markets for pig iron, and sold over 225,000 tons, 160,000 tons to Japan.

Strong Recovery Features German Steel Industry

European Staff Special

THE most important development of 1935 in the German steel industry was the return of the Saar to Germany. During the first ten months of 1935, the production of steel was 13,165,684 metric tons, compared with 9,760,388 tons in the corresponding period of 1934.

The economic revival, which already was conspicuous in 1934, has achieved further progress both in the coal-mining and iron and steel industries, but it must be observed that the improvement in the iron and steel industries was chiefly restricted to the home market.

It was owing to the larger demand for home consumption that it was possible further to increase German production in 1935, the increase in production of raw steel during the first ten months being 35 per cent in comparison with the corresponding period of 1934, and the increase in output of finished steel products, 15.7 per cent. These figures take account of the Saar output as from March.

This increase in German production is, to a considerable extent, due to measures taken by the German government to provide work, which have proved highly beneficial to employment in numerous branches of the finishing industries. The execution of extensive public works, construction of national motor roads, the manifold requirements of the German vehicle, shipbuilding and armament industries called for large quantities of iron and steel to supply foundries, engineering works, etc., that were able to book more orders.

Moreover, the iron and steel industrialists themselves, who during the worst period of the crisis (1931 to 1933) had hardly been able to effect any renewel of their plant, were able, during 1935, to put in hand important improvements and order new mechanical equipment to enlarge production capacity.

The great increase in German production of iron and steel can also be attributed to the return of the Saar, which had far-reaching consequences. Not only was this return responsible for an increase in the productive capacity of the German iron and steel industries, but it also brought about considerable improvement in the trade and foreign exchange position of Germany, and consequently an improvement in the national economy.

Exports Show Good Gain

The tonnage of pig iron, semifinished, finished products and scrap made in Germany and exported during the first ten months totaled 2,619,940 metric tons, which compares with 2,146,440 tons in the first ten months of 1934, showing an increase of 473,500 tons or 22 per cent.

Dealing with this point, Privy Councillor Klockner, at the general meeting of his company, suggested that it would be well for the German iron and steel industries to endeavor to increase their exports. In the opinion of this well-known industrialist, the prospects are not unfavorable, and with the improvement in the economic position in Holland, the Scandinavian countries, South America and the Far East, it could certainly be done. Privy Councillor Klockner also pointed out that some increase in exports might perhaps prove useful to make good any possible falling off in the home market.

Imports of iron and steel products and scrap into Germany during the first ten months showed a decrease of 872,975 metric tons, reaching 763,836 metric tons, against 1,636,811 tons in ten months of 1934.

According to these figures, the balance of the German foreign trade in iron and steel during the first ten months of 1935 improved to the extent of 1,346,475 metric tons in

German Business Progress in 1935

(Metric tons 000 omitted)

Mo. ave.	PRODUCTION* Coke	Pig iron and ferro-alloys	No. fur-† naces in blast	Steel ingots and castings	IMPORTS‡ Pig iron and ferro-alloys	Steel§	EXPORTS‡ Coke	Pig iron and ferro-alloys	Steel§
1913	2,639	910	204	993	11.0	41	534	71	470
1932	1,629	328	42	481	5.3	61	432	6.0	201
1933	1,763	439	48	634	6.3	101	448	9.6	169
1934	2,018	728	73	990	7.7	151	514	13.8	200
1935									
Jan.	2,263	880	75	1,137	3.5	119	627	13.9	200
Feb.	2,075	809	75	1,065	3.4	110	534	7.8	193
March	2,260	1,000	95	1,297	3.3	61	471	12.3	234
April	2,124	933	92	1,224	2.0	56	448	14.1	237
May	2,284	1,002	93	1,315	2.0	50	486	22.6	244
June	2,233	979	94	1,249	3.6	59	497	19.2	254
July	2,488	1,093	98	1,447	2.8	68	526	18.3	289
Aug.	2,513	1,145	100	1,496	1.8	63	583	20.6	263
Sept.	2,484	1,113	104	1,378	12.8	69	652	25.5	253
Oct.	2,691	1,198	106	1,551	13.3	58	640	27.3	271
Mo. ave.	2,341	1,015	...	1,317	4.9	72	546	18.2	244

*Figures for 1913 are for Germany in her present boundaries, but without the Saar. From March 1935, onward, Saar production is included in German figures.

†On last day of year, or month.

‡Figures for 1913 are for pre-war boundaries and include Luxemburg. The returns comprise the Saar from Feb. 18, 1935.

§Includes iron castings and scrap.

comparison with the corresponding period of the previous year. This improvement, of course, must again be attributed to the return of the Saar iron and steel industries to Germany and the consequences of that return, namely, the abolition of the Lorraine import quotas against the Saar iron exports to France, and the higher participation of Germany in the International Raw Steel Export association, her quotas having been increased by 200,000 tons as a result of this abolition.

In exports there was a loss of approximately 80,000 tons to Holland compared with the previous year, while a definite increase of German exports to the most important overseas markets is noticeable. Generally speaking, the increase in exports related chiefly to pig iron, heavy structural steel, tubes, and plates and sheets, while there was a decrease in the importation of these products into Germany.

Domestic Prices Are Stable

A certain volume of Germany's steel exports were in the form of barter transactions, as, for example, the bartering of Norwegian whale oil for German shipbuilding materials, or South African wool for German railway equipment. It is pointed out that such transactions already took place many years ago, more particularly with countries where the parties concerned, being unable to obtain the necessary foreign currency, frequently had to supply goods in payment for industrial products.

Home market prices, which were fixed in 1931, have undergone practically no change in the meantime. Since the beginning of 1935 the Brussels Iron & Steel Exchange quotations have not shown any appreciable fluctuations as regards world prices, with the exception of quotations for ship plates, which were increased by approximately 2½ gold shillings in July, 1935.

The continued increase in production of the German iron and steel industries naturally placed higher demands upon the supply of raw materials, but so far there has been no evidence of shortage as regards coke or iron ore. The compulsory increase of the use of pig iron in the production of open-hearth steel, which came into force on April 1, led to a higher consumption of pig iron.

The increased requirements of iron ore were met by a larger utilization of home-produced ores, which are being treated by special processes, and also by increased imports of foreign ore. Incidentally, the higher pig iron consumption resulted in the establishment of easier conditions in the scrap market.

Questions of vital importance to the organization of the German sales associations arose during the first nine months of 1935, since following the re-incorporation of the Saar industry, certain difficulties were encountered in respect of the determination of contracts and quota demands connected with the Saar works.

After protracted negotiations it was possible fully to re-include the Saar works in the German sales organizations, the continued existence of which may be looked upon as being assured up to the middle of 1936, as a result of the extension of the so-called group protection agreement. Under that agreement, the Saar works have undertaken, subject to certain conditions and until June 30, 1936, to refrain from manufacturing any of the products, not hitherto made by them, covered by the group protection.

With the co-operation of the authorities, an association of manufacturers of welded tubes was created early in 1935, for the purpose of controlling the home market in respect of welded tubes and adjusting the prices for these products. At the same time the proportion of the production of the tube-welding works to that of the works controlled by the tube association was determined. Moreover, a decree of the German minister of economy dated July 29, 1935, extended the existing compulsory combine for wire and wire products until the end of 1936.

The balance sheets so far published by three large companies, namely: the Hoesch-Koln-Neuessen Aktiengesellschaft fur Bergbau und Huttenbetrieb, of Dortmund, the Klockner Werke Aktiengesellschaft, of Castrop-Rauxel, and the Gutehoffnungshutte Oberhausen Aktiengesellschaft, of Oberhausen, are proof of how large outputs are able to favor the German iron and steel industries. The two companies first mentioned were able to distribute a dividend of 3 per cent, while the holding company of the Gutehoffnungshutte, Oberhausen, and the Gutehoffnungshutte Aktienverein fur Bergbau und Huttenbetrieb, of Nuremberg, paid a dividend of 3½ per cent.

To sum up, it can be stated that during 1935 the German iron and steel industries were very busy. The consumption of iron and steel products per head of population rose from 14.8 kg., the monthly average for 1934, to 16.3 kg., the monthly average for the first half of 1935.

Italy Speeds Up Production And Industrial Organization

BY DR. GUIDO VANZETTI,
Special Correspondent, STEEL

THERE was a considerable increase in activities of the Italian steel industry during 1935, particularly at its close, and the output of steel for the year, which is estimated at about 2,250,000 metric tons, is an all-time record for Italy, representing 75 per cent of the capacity of production of Italian steel furnaces. The production of rolling mill products exceeded 1,950,000 metric tons, against 1,558,838 tons in 1934 and 1,951,700 tons in the peak year of 1929.

The output of pig iron in Italy in 1935 was 625,000 metric tons, compared with 521,444 tons in 1934 and 679,000 tons in the record year of 1929. The 1935 output represented about 78 per cent of the capacity of production and did not quite reach the record output of 1929. There was a marked increase in the production of ferroalloys, which reached 65,000 metric tons, against 52,048 tons in 1934 and 51,800 tons in 1929.

The increase in the Italian production of iron and steel has naturally called for a larger volume of imports of coal, and during the first nine months of 1935 the tonnage of coal imported was 10,833,723 metric tons, compared with 8,665,216 tons in the same period of 1934. More iron and steel scrap was also required, and during the first nine months of 1935, imports of scrap totaled 718,399 metric tons, against 539,495 tons in the corresponding period of 1934 and 731,708 tons for the whole of 1934.

Up to the moment when economic sanctions were imposed against Italy, imports of iron and steel scrap came from the usual sources, mainly from France. There was also an increase in imports of iron and steel products, especially material that was re-exported after being worked up, and in respect of the greater needs of the country for the manufacture of war material.

During the first nine months of 1935, total imports of iron and steel

were 288,251 metric tons, compared with 240,954 tons in the same period of 1934. For the whole of 1934, imports totaled 306,860 tons, which tonnage was exceeded in 1935.

The Nuova Unione Siderurgica Italiana, which controls all the steelworks and rolling mills of Italy, establishes prices for rolling mill products, and during 1935 these prices followed an upward trend, owing to an increase in the cost of raw materials and the greater demand for steel products. From the beginning of the year up to Nov. 10, steel prices increased by an average of 20 per cent.

Sanctions Come Into Play

The events that occurred in Italy during the course of 1935 brought about a strengthening of the central organization and control of the entire iron and steel industry. At the same time, strong measures were taken to protect the Italian currency and the national stock of gold, and, with this object in view, it was found necessary to limit foreign importations to the strict minimum.

A central organization was set up, the function of which was to allocate foreign raw materials to the various industries using those materials. One committee, presided over by Prof. G. Sirovich, is in charge of the allocation of raw materials used by the iron and steel industry. The various industrial federations themselves allocate the quota allotted to their industry to the various works. In this way, the whole supply of foreign raw materials to Italy is controlled and divided among the consuming industries by means of an organization which is under the supervision of the state.

The iron and steel interests themselves have set up an organization entitled Consorzio Nazionale Approvvigionamenti Materie Prime Siderurgiche, with head office in Milan. This body was set up for the purpose of purchasing iron and steel scrap, refractory materials and pig iron for the steelworks.

The application of sanctions acted as an incentive toward the tightening up of these organizations, to enable the country to continue producing on a large scale. It was decided to divert the buying of foreign raw materials to those countries which did not commit themselves to the application of sanctions.

Steps were also taken to restrict the tonnage of materials imported from foreign countries by reducing the requirements of the civilian population, and endeavors were made to eliminate waste and utilize materials in the most efficient manner possible and, wherever possible, to replace foreign material by domestic products, as, for instance, ferro-silicomanganese for refining steel instead of ferromanganese. The open-hearth furnaces are also charged with a higher percentage of pig iron manufactured in the country.

Belgium and Luxemburg Seek To Keep Export Markets

European Staff Special

A CERTAIN number of incompleted contracts enabled Belgian steelworks to start 1935 under conditions of apparent activity, but a number of unfavorable factors soon caused the situation to deteriorate.

It is well known that Belgium and Luxemburg both depend to a large extent upon their export trade to keep their modern steel mills operating near normal capacity, and during 1935 many countries increased their tendency to become more and more self-sufficient. The agreement between the European steel cartel and the British Iron and Steel federation to limit the tonnage of continental steel exported to Great Britain had, from that point of view, a detrimental effect on Belgian and Luxemburg exports, and as the year advanced, the competition from other steel-producing countries in overseas markets became more acute.

Belgian producers had to meet competition from American works in the Far East markets, and difficulties were experienced in Japan, which country is becoming more and more self-supporting. Japan still buys semifinished steel, but it manufactures more and more finished products and is favored by relatively low production costs. The preferential tariff in India, which favors imports of British products, also had an unfavorable influence on Belgo-Luxemburg steel trade. Finally, an increase in the price of coal and coke counteracted the efforts made by Belgian steelmakers to lower their costs.

As a result of the many difficulties which confronted the Belgian government early in the year, and following the ministerial crisis, a new government was set up under the leadership of Mr. Van Zeeland, who immediately took steps to devaluate the Belgian franc. This action did not have the immediate effect of facilitating Belgian exports, but it was hoped that it would gradually improve domestic conditions, and the trend of business during the latter part of the year indicated that such an improvement was in view.

As a result of the devaluation of the Belgian currency, domestic prices of certain steel products were increased: basic bessemer steel billets, which were 440 Belgian francs per metric ton at the beginning of the year, were 540 francs as from May, the price of merchant bars and shapes rose from 550 to 600 francs, that of hoops and bands from 700 to about 840 francs, that of foundry pig iron from 310 to 370 francs and that of basic bessemer pig iron from 280 to 330 francs.

Between March and October the index of the cost of living rose by about 8 per cent, and, as a result,

Belgian and Luxemburg Business Progress in 1935

(Metric tons 000 omitted)

	PRODUCTION					IMPORTS		EXPORTS	
		Belgium		Luxemburg		Belgium and Luxemburg			
Mo. ave.	Coke	Pig iron and ferro-alloys	Steel ingots and castings	Pig iron and ferro alloys	Steel ingots and castings	Pig iron	Steel§	Pig iron	Steel§
1913	294	207	206	212	98	48†	26†	1.4†	130†
1932	368	229	232	163	163	17	18	3.0	285
1933	366	226	228	157	154	18	16	3.1	283
1934	336	242	246	167	160	18	19	3.6	304
1935									
Jan.	371	248	246	169	166	14	19	1.7	341
Feb.	339	230	233	153	152	14	15	2.3	277
March	371	252	250	148	143	13	14	1.9	291
April	367	252	251	154	156	17	10	3.3	288
May	394	271	274	165	167	21	10	2.5	291
June	382	258	246	161	158	15	14	2.7	332
July	413	263	256	157	153	18	18	3.7	293
Aug.	410	259	257	154	149	19	10	3.9	230
Sept.	398	239	230	148	138	16	18	4.4	298
Oct.	415	260	261	149	143				
Mo. ave.	386	253	250	155	152	16	14	2.9	293

†Belgium only.
§Includes iron castings and scrap.

wages were increased by 2½ per cent in July and by a further 2½ per cent in October.

The most important event in connection with export trade was the negotiations that took place, through the International steel cartel, with the British Iron and Steel federation. Previous to those negotiations, the British government had increased the import duty on foreign steel, and this considerably reduced the possibilities of exporting steel to the British market.

Export Tonnage Is Curtailed

As a result of the agreement between the British Iron and Steel federation and the continental cartel, a tonnage of 675,000 tons of steel was allocated to continental works and was permitted to enter the British market under reduced tariff. At the same time, further negotiations took place covering the allocation of export markets outside Europe to Great Britain and the continent.

While these agreements definitely curtailed the tonnage of Belgian steel that could be exported to Great Britain, it had the beneficial result of preventing any tendency for export prices to fall below an economic level, and, in fact, the export price of a number of products, particularly plates and sheets, increased shortly after the agreement between the British federation and the cartel, and 3/16-inch plates, which were £4 (gold) at the beginning of the year, increased to £4 5s.

For Belgium, the output of steel ingots and castings during the first ten months was 2,505,187 metric tons, against 2,449,081 tons in the corresponding period of 1934, showing a slight decrease of about 55,000 tons. For Luxemburg, the output in the ten-month period was 1,524,587 metric tons, compared with 1,596,103 tons, actually indicating a decrease in the production of 1935.

Toward the end of the year there was greater activity in certain export markets, and the considerable improvement in conditions in Great Britain, which caused a dearth of semifinished steel, brought about an increase in the quota of steel allowed to be imported from foreign countries, and Belgium had a share in this.

Some Gains Are Made

Resulting from these conditions, the situation of the works at the end of the year had improved. Furthermore, thanks to the measures taken to reduce costs of production, a small number of Belgian works, such as La Providence and the Phoenix works, were able to show a profit for the past financial year.

Notwithstanding this partial improvement, the future is contemplated with considerable anxiety, owing to the greater tendency for distant countries to increase their own production of finished steel products, and it is felt that during 1936 much thought will have to be given to adaptation to new conditions.

British Steel Trade Makes Substantial Progress

(Concluded from Page 279)

tirely to rebuild the steelworks, rolling mills and melting shops.

These reconstructions will necessarily occupy some time, and it is calculated that the steelworks cannot very well be in full operation for twelve months. Richard Thomas & Co. Ltd. has abandoned the idea of erecting works in Lincolnshire, and the tin plate trade, so far as that great company is concerned, remains centered in Wales.

Although the restriction of imports by quotas took effect only as from August, there was a marked decrease in imports of foreign steel into Great Britain, total imports of iron and steel during the first ten months of the year being 961,967 tons, against 1,148,375 tons in the corresponding period of 1934, a decrease of 16 per cent. The reduction in imports was mostly in respect of semifinished steel from Belgium and France.

Looking at the prospects for 1936, a feeling of buoyancy pervades the iron and steel markets. There is a growing feeling of optimism that events are shaping themselves for a further period of increasing prosperity under a stable government, and this optimism has a sure foundation in the business which has already been booked over the next twelve months.

Steel Ingot Production

Compiled by American Iron and Steel Institute

Gross Tons

	1926		†1927		†1928		†1929		†1930	
	Total	Daily Av.	Total	Daily Av.	Total	Daily Av.	Total	Daily Av.	Total	Daily Av.
January	4,132,210	158,931	3,789,874	145,764	3,990,902	153,496	4,500,131	166,672	3,778,235	139,935
February	3,785,051	157,710	3,812,046	158,835	4,043,457	161,738	4,328,713	180,363	4,035,111	168,130
March	4,468,617	165,504	4,535,272	167,973	4,507,217	166,934	5,068,176	194,930	4,254,331	163,628
April	4,105,799	157,915	4,127,335	158,744	4,305,382	172,215	4,950,053	190,387	4,109,492	158,057
May	3,927,979	151,076	4,047,251	155,663	4,207,212	155,823	5,286,246	195,787	3,982,915	147,515
June	3,734,153	143,621	3,495,609	134,446	3,743,903	143,996	4,902,955	196,118	3,418,535	136,741
July	3,634,993	139,807	3,204,135	128,165	3,805,598	152,224	4,850,583	186,561	2,922,220	112,393
August	3,986,966	153,345	3,498,549	129,576	4,178,610	154,763	4,939,086	182,929	3,060,763	117,722
September	6,913,383	150,515	3,268,881	125,726	4,147,893	165,916	4,527,887	181,115	2,840,379	109,245
October	4,074,544	156,713	3,316,292	127,550	4,649,968	172,221	4,534,326	167,938	2,692,539	99,724
November	3,705,744	142,529	3,127,015	120,270	4,266,835	164,109	3,521,111	135,427	2,212,220	88,489
December	3,466,766	133,337	3,175,484	122,134	4,018,208	160,728	2,903,012	116,120	1,979,547	76,136
Total	46,936,205	*150,920	43,397,743	*139,543	49,865,185	*160,338	54,312,279	*174,638	39,286,287	*126,322

	†1931		†1932		†1933		†1934		†1935	
	Total	Daily Av.	Total	Daily Av.	Total	Daily Av.	Total	Daily Av.	Total	Daily Av.
January	2,512,140	93,042	1,484,991	57,115	1,016,870	39,110	1,997,129	73,968	2,871,531	106,353
February	2,547,027	106,126	1,481,253	59,250	1,073,012	44,709	2,211,944	92,164	2,777,765	115,740
March	3,054,339	117,475	1,433,337	53,087	898,236	33,268	2,798,440	103,646	2,868,141	110,313
April	2,766,959	106,421	1,259,629	48,447	1,345,422	53,817	2,936,064	117,443	2,640,504	101,558
May	2,551,633	98,140	1,125,243	43,279	1,976,428	73,201	3,399,494	125,907	2,635,857	97,624
June	2,127,762	81,837	912,757	35,106	2,564,420	98,632	3,059,483	117,672	2,230,893	89,236
July	1,887,580	72,599	806,722	32,269	3,168,354	126,734	1,489,453	59,578	2,270,224	87,316
August	1,716,829	66,032	846,730	31,360	2,863,569	106,058	1,381,350	51,161	2,919,326	108,123
September	1,545,411	59,439	991,858	38,148	2,283,079	87,811	1,268,977	50,759	2,829,835	113,193
October	1,590,180	58,896	1,087,058	41,810	2,084,894	80,188	1,481,902	54,885	3,146,446	116,535
November	1,591,644	63,666	1,032,221	39,701	1,521,189	58,507	1,610,625	61,947	3,153,247	121,279
December	1,301,211	50,047	861,034	33,117	1,798,606	71,944	1,964,257	78,570		
Total	25,192,715	*81,006	13,322,833	*42,701	22,594,079	*72,884	25,599,118	82,312	‡30,313,507	*105,991

*Average. †Beginning with 1927, the Institute excludes crucible and electric ingots, which totaled 675,123 tons in 1927, 810,029 tons in 1928, 958,076 tons in 1929, 614,852 tons in 1930, 412,489 tons in 1931, 241,756 tons in 1932, 421,884 tons in 1933, and 361,827 tons in 1934.
‡Eleven months.

110 YEARS

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December Pig Iron Output Highest Since 1929

Steel Rate Up to 49½ Per Cent—Markets Strong At Outset of New Year

MARKET IN TABLOID

DEMAND . . . *Strong for sheets, strip, bars, wire.*

PRICES . . . *Steady. Scrap firm.*

PRODUCTION . . . *Ingots up 1½ points to 49½ per cent. December pig iron output largest for month since 1929.*

SHIPMENTS . . . *Increasing after holidays.*

PRODUCTION of coke pig iron in December, 2,116,534 gross tons, was the highest for that month since 1929, and compares with 2,836,917 tons in that year.

Due to the extra working day in December the output was 2.43 per cent over November, although the daily average was off 0.8 per cent. Merchant pig iron shipments in the month were about 65 per cent heavier than in November, while consumption by steelworks was fairly steady, so that the gain in shipments apparently was attained by reducing pig iron stocks.

For the full year 1936, production of 21,041,521 tons was 31.7 per cent higher than in 1934, and largest since 1930. The number of active stacks at the close of December was 119, a net loss of three in the month.

Steelworks operations last week advanced 1½ points to 49½ per cent, producers generally continuing active through New Year's day. Pittsburgh operations were up 4 points to 38 per cent; Youngstown 3 to 62; Cleveland 32 to 72; Buffalo 3 to 50. Eastern Pennsylvania was down ½-point to 34; Chicago 3 to 47; New England 2 to 75, and other districts were unchanged. Tin plate and sheet mill operations snapped back to 75 per cent.

Santa Fe is first this year to make a large rail purchase, distributing 58,000 tons to several producers. Last year at this time it placed 25,883 tons. Santa Fe also is taking bids on 550 freight cars, and Aluminum Co. of America on 22 70-ton hopper cars. Carbuilders estimate domestic freight car orders this year may total 35,000 to 40,000, largest since 1930, when 45,146 were bought. The number in 1935 was approximately 20,000. Pennsylvania is reported considering purchasing 100 locomotives.

Structural shape awards for the week, 20,075 tons, were slightly higher than in the preceding week. General Motors Corp. placed 4200 tons with Consolidated Steel Corp., Los Angeles, for an assembly plant in that city. Small shape specifications continue to gain. In public works construction of all kinds a great volume of steel requirements is accumulating for award in the early months this year, although much of it, including pipe lines, depending on weather conditions, will not be specified until spring. United Dry Docks Inc., New York, is inquiring for 3000 tons of plates for three New York ferryboats, and barges, which it recently booked. About 20,000 tons of steel is required for four tankers for Pan-American Oil & Transportation Co.

Price advances on semifinished steel and pig iron, which were inaugurated in November but did not become immediately operative because of many prior contracts, became generally applicable Jan. 1. Acquired consumer stocks, however, will defer an actual test for several weeks, although in pig iron there has been some small-lot buying for January at the increase of $1 a ton. Warehouses have raised cold-finished steel bars $3 a ton, in conformity with the recent advance in the mill price.

Scrap prices are strong, and supplies limited. As on evidence of this, a Donora, Pa., consumer paid $14.50 per ton for No. 1 heavy melting steel, up 25 cents. Foreign ores show a rising tendency; tungsten and chrome ores have been raised slightly, and one seller has advanced African manganese ore.

STEEL's London editor in his current cable comments on increasing iron and steel demand in Great Britain, and strength in prices. Industrial costs are expected to mount in 1936.

For the third consecutive week STEEL's price composites are unchanged, iron and steel holding at $33.31; finished steel $53.70, and steelworks scrap $13.12.

COMPOSITE MARKET AVERAGES

	Jan. 4	Dec. 28	Dec. 21	One Month Ago Dec., 1935	Three Months Ago Oct., 1935	One Year Ago Jan., 1935	Five Years Ago Jan., 1931
Iron and Steel	$33.31	$33.31	$33.31	$33.31	$32.84	$32.58	$31.69
Finished Steel	53.70	53.70	53.70	53.70	53.70	54.00	49.30
Steelworks Scrap	13.12	13.12	13.12	13.17	12.72	12.03	10.49

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

	Jan. 4, 1936	Dec. 1935	Oct. 1935	Jan. 1935
Finished Material				
Steel bars, Pittsburgh	1.85c	1.85	1.85	1.80
Steel bars, Chicago	1.90	1.90	1.90	1.85
Steel bars, Philadelphia	2.16	2.16	2.16	2.09
Iron bars, Terre Haute, Ind.	1.75	1.75	1.75	1.75
Shapes, Pittsburgh	1.80	1.80	1.80	1.80
Shapes, Philadelphia	2.01½	2.01½	2.01½	2.00½
Shapes, Chicago	1.85	1.85	1.85	1.85
Tank plates, Pittsburgh	1.80	1.80	1.80	1.80
Tank plates, Philadelphia	2.00	1.99	1.99	1.98½
Tank plates, Chicago	1.85	1.85	1.85	1.85
Sheets, No. 10, hot rolled, Pitts.	1.85	1.85	1.85	1.85
Sheets, No. 24, hot ann., Pitts.	2.40	2.40	2.40	2.40
Sheets, No. 24, galv., Pitts.	3.10	3.10	3.10	3.10
Sheets, No. 10, hot rolled, Gary	1.95	1.95	1.95	1.95
Sheets, No. 24, hot anneal., Gary	2.50	2.50	2.50	2.50
Sheets, No. 24, galvan., Gary	3.20	3.20	3.20	3.20
Plain wire, Pittsburgh	2.30	2.30	2.30	2.30
Tin plate, per base box, Pitts.	5.25	5.25	5.25	5.25
Wire nails, Pitts	2.40	2.40	2.40	2.60
Semifinished Material				
Sheet bars, open-hearth, Youngs.	$30.00	30.00	28.00	28.00
Sheet bars, open-hearth, Pitts.	30.00	30.00	28.00	28.00
Billets, open-hearth, Pittsburgh	29.00	29.00	27.00	27.00
Wire rods, Pittsburgh	40.00	38.00	38.00	38.00

	Jan. 4, 1936	Dec. 1935	Oct. 1935	Jan. 1935
Pig Iron				
Bessemer, del. Pitts.	$20.8132	$20.8132	$19.8132	$19.76
Basic, Valley	19.00	19.00	18.00	18.00
Basic, eastern, del. eastern Pa.	20.8132	20.8132	19.8132	19.76
No. 2 fdry., del. Pitts.	20.3132	20.3132	19.3132	19.26
No. 2 fdry., Chicago	19.50	19.50	18.75	18.50
Southern No. 2, Birm.	15.50	15.50	14.50	14.50
Southern No. 2 del. Cincinnati	20.2007	20.2007	19.2007	19.13
No. 2X eastern, del. Phila.	21.6882	21.6882	20.6882	20.63
Malleable, Valley	19.50	19.50	18.50	18.50
Malleable, Chicago	19.50	19.50	18.75	18.50
Lake Sup. charcoal, del. Chi.	25.2528	25.2528	24.8728	24.04
Ferromanganese, del. Pitts.	90.13	90.13	90.13	89.79
Gray forge, del. Pitts.	19.6741	19.6741	18.6741	18.63
Scrap				
Heavy melting steel, Pittsburgh	$14.50	14.05	13.65	13.50
Heavy melt. steel, No. 2, east. Pa.	11.25	11.25	11.00	9.71
Heavy melting steel, Chicago	13.25	13.35	12.50	12.15
Rails for rolling, Chicago	14.25	14.50	14.00	12.90
Railroad steel specialties, Chicago	14.25	14.25	13.50	13.40
Coke				
Connellsville, furnace, ovens	$3.50	3.55	3.55	3.60
Connellsville, foundry, ovens	4.00	4.10	4.35	4.60
Chicago, by-product foundry, del.	9.75	9.75	9.75	9.25

Steel, Iron, Raw Material, Fuel and Metals Prices

Except when otherwise designated, prices are base, f.o.b. cars. Asterisk denotes price change this week

Sheet Steel

Hot Rolled No. 10, 24-48 in.

Pittsburgh	1.85c
Gary	1.95c
Chicago, delivered	1.98c
New York, del.	2.20c
Philadelphia, del.	2.16c
Birmingham	2.00c
St. Louis, del.	2.18c
Pacific ports, f.o.b. cars, dock	2.40c

Hot Rolled Annealed No. 24

Pittsburgh	2.40c
Gary	2.50c
Chicago, delivered	2.53c
Detroit, delivered	2.45c-2.60c
New York, del.	2.75c
Philadelphia, del.	2.71c
Birmingham	2.55c
St. Louis, del.	2.72c
Pacific ports, f.o.b. cars, dock	3.05c

Galvanized No. 24

Pittsburgh	3.10c
Gary	3.20c
Chicago, delivered	3.23c
Philadelphia, del.	3.41c
New York, del.	3.45c
Birmingham	3.25c
St. Louis, del.	3.43c
Pacific ports, f.o.b. cars, dock	3.70c

Tin Mill Black No. 28

Pittsburgh	2.75c
Gary	2.85c
St. Louis, delivered	3.08c

Cold Rolled No. 10

Pittsburgh	2.50c
Gary	2.60c
Detroit, delivered	2.55c-2.70c
Philadelphia, del.	2.81c
New York, del.	2.85c
Pacific ports, f.o.b. cars, dock	3.10c

Cold Rolled No. 20

Pittsburgh	2.95c
Gary	3.05c
Detroit, delivered	3.00c-3.15c
Philadelphia, del.	3.26c
New York, del.	3.30c

Enameling Sheets

Pittsburgh, No. 10	2.50c
Pittsburgh, No. 20	3.10c
Gary, No. 10	2.60c
Gary, No. 20	3.20c

Tin and Terne Plate

Gary base, 10 cents higher.

Tin plate, coke base (box) Pittsburgh	$5.25
Do., waste-waste	2.75c
Do., strips	2.50c
Long ternes, No. 24 unassorted, Pitts.	3.40c
Do., Gary	3.50c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	23.00	24.00
Plates	26.00	28.00
Sheets	33.00	35.00
Hot strip	20.75	22.75
Cold strip	27.00	29.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	17.00	18.50	21.00	26.00
Plates	20.00	21.50	24.00	29.00
Sheets	25.00	28.00	31.00	35.00
Hot strip	15.75	16.75	21.75	26.75
Cold strip	20.50	22.00	27.00	35.00

Steel Plates

Pittsburgh	1.80c
New York, del.	2.09c
Philadelphia, del.	1.99c
Boston, delivered	2.22c
Buffalo, delivered	2.05c
Chicago or Gary	1.85c
Cleveland, del.	1.99½c
Birmingham	1.95c
Coatesville, base	1.90c
Sparrows Pt., base	1.90c
Pacific ports, f.o.b. cars, dock	2.35c
St. Louis, delivered	2.08c

Structural Shapes

Pittsburgh	1.80c
Philadelphia, del.	2.01½c
New York, del.	2.06½c
Boston, delivered	2.20½c
Bethlehem	1.90c
Chicago	1.85c
Cleveland, del.	2.00c
Buffalo	1.90c
Gulf Ports	2.20c
Birmingham	1.95c
Pacific ports, f.o.b. cars, dock	2.35c

Bars

Soft Steel

(Base, 5 to 25 tons)

Pittsburgh	1.85c
Chicago or Gary	1.90c
Duluth	2.00c
Birmingham	2.00c
Cleveland	1.90c
Buffalo	1.95c
Detroit, delivered	2.00c
Pacific ports, f.o.b. cars, dock	2.40c
Philadelphia, del.	2.16c
Boston, delivered	2.27c
New York, del.	2.20c
Pitts., forg. qual.	2.10c

Rail Steel

To Manufacturing Trade

Pittsburgh	1.70c
Chicago or Gary	1.75c
Moline, Ill.	1.75c
Cleveland	1.75c
Buffalo	1.80c

Iron

Troy, N. Y.	1.70c
Terre Haute, Ind.	1.75c
Chicago	1.80c
Philadelphia	2.06c
Pittsburgh, refined	2.75-7.50c

Reinforcing

New billet, straight lengths, quoted by distributors.

Pittsburgh	2.05c
Chicago, Gary, Buffalo, Cleve., Birm., Young.	2.10c
Gulf ports	2.45c
Pacific coast ports f.o.b. cars dock	2.45c
Philadelphia, del.	2.36c

Rail steel, straight lengths, quoted by distributors

Pittsburgh	1.90c
Chicago, Buffalo, Cleveland, Birm., Young.	1.95c
Gulf ports	2.30c

Wire Products

Wire Products
(Prices apply to straight or mixed carloads; less carloads $4 higher; less carloads fencing $5 over base column.)

Base Pitts.-Cleve. 100 lb. keg.	
Standard wire nails	$2.40
Cement coated nails	2.40
Galvanized nails, 15 gage and coarser	4.40
do. finer than 15 gage	4.90

(Per pound)

Polished staples	3.10c
Galvanized fence staples	3.35c
Barbed wire, galv.	2.80c
Annealed fence wire	2.45c
Galvanized fence wire	2.80c
Woven wire fencing (base column, c.l.)	$61.00

To Manufacturing Trade

Plain wire, 6-9 gage	2.30c

Anderson, Ind. (merchant products only) and Chicago up $1; Duluth up $2; Birmingham up $3.

Spring wire, Pittsburgh or Cleveland	2.90c

Do., Chicago up $1. Worcester, $2.

Cold-Finished Carbon Bars and Shafting

Base, Pitts., one size, shape, grade, shipment at one time to one destination

10,000 to 19,999 lbs.	2.10c
20,000 to 59,999 lbs.	2.05c
60,000 to 99,999 lbs.	2.00c
100,000 lbs. and over	1.97½c

Gary, Ind., Cleve., Chi., up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

Alloy Steel Bars (Hot)

Pittsburgh, Buffalo, Chicago, Massilon, Canton, Bethlehem 2.45c

Alloy S.A.E.	Diff.	Alloy S.A.E.	Diff.
2000	0.25	3100	0.55
2100	0.55	3200	1.35
2300	1.50	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo. 0.50
4600 0.20 to 0.30 Mo, 1.25-1.75 Ni. 1.05
5100 0.80-1.10 Cr. 0.45
5100 Cr. spring base
6100 bars 1.20
6100 spring 0.70
Cr., Ni., Van. 1.50
Carbon Van. 0.95
9250 ....carbon base plus extras

Piling

Pittsburgh	2.15c
Chicago, Buffalo	2.25c

Strip and Hoops

Hot strip to 23½-in.	
Pittsburgh	1.85c
Chicago or Gary	1.95c
Birmingham base	2.00c
Detroit, delivered	2.05c
Philadelphia, del.	2.16c
New York, del.	2.20c
Cooperage hoop,	
Pittsburgh	1.95c
Chicago	2.05c
Cold-strip, Pitts. Cleve.	2.60c
Detroit, del.	2.65c
Worcester, Mass.	2.80c

Rails, Track Material

(Gross Tons)

Standard rails, mill	$36.37½
Relay rails, Pitts.	
20-45 lbs.	$28.00
45-50 lbs.	$25.00
50-60 lbs.	$26.00
70-75 lbs.	$24.50
80-90 lbs.	$26.00
100 lbs.	$27.00
Light rails, billet qual. Pitts., Chi.	$35.00
Do., reroll, qual.	34.00
Angle bars, billet, Gary, Ind., So. Chi.	2.55c
Do., axle steel	2.10c
Spikes, R. R. base	2.60c
Track bolts, base	3.60c
Tie plates, base	1.90c

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $2; 16 and 20 lbs., up $1; 12 lbs. up $2; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons.

Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots, Dec. 1, 1932, lists, 10% extra for less full containers.

Carriage and Machine

½ x 6 and smaller	70-10-5 off
Do. larger	70-10 off
Tire bolts	55 off

Plow Bolts

All sizes	70-10 off

Stove Bolts

In packages with nuts attached 72½-10 off; in packages with nuts separate 72½-10-5 off; in bulk 82½ off on 15,000 of 3-inch and shorter, or 5000 over 3-inch.

Step bolts	65-5 off
Elevator bolts	65-5 off

Nuts

S. A. E. semifinished hex., ½ to ⅞-inch	60-20-15 off
Do., 1 to 1-inch	60-20-15 off
Do., over 1-inch	60-20-15 off

Hexagon Cap Screws

Milled	80-10-10 off
Upset, 1-in. smaller	85 off

Square Head Set Screws

Upset, 1-in. smaller	75-10 off
Headless set screws	75 off

Rivets, Wrought Washers

Struc., c. l., Pittsburgh, Cleveland	2.90c
Struc., c. l., Chicago	3.00c
⅞-in. and smaller, Pitts., Chi., Cleve.	70 and 5 off
Wrought washers, Pitts., Chi., Phila., to jobbers & large nut, bolt mfrs.	$6.25 off

Cut Nails

Cut nails, Pitts.; (10% discount on size extras)	$2.75
Do. less carloads, 5 kegs or more, no discount on size extras	$3.05
Do., under 5 kegs; no disc. on size extras	$3.20

Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads, Gary, Ind., 2 points less, Chicago, del. 2½ points less. Wrought pipe, Pittsburgh.

Butt Weld

Steel

In.	Blk.	Galv.
¼ and ⅜	53½	35
½	58½	47
¾	62	52
1—3	64	55

Iron

½	31½	15
¾	36½	20½
1—1¼	39½	25½
2	41½	26

Lap Weld

Steel

2	60	51
2½—3	63	54
3½—6	65	56
7 and 8	64	54
9 and 10	63½	53½

Iron

2	37	22½
2½—3½	38	25
4—8	40	28½

Line Pipe

Steel

½, butt weld	57½
⅛-inch butt weld	50½
¼—⅜, butt weld	52½
¾, butt weld	61
1—3, butt weld	63
2-inch, lap weld	59
2½—3, lap weld	62
3½—6, lap weld	64
7—8, lap weld	63

Iron

⅛—1½ inch, black and galv. take 4 pts. over; 2½—6 inch 2 pts. over discounts for same sizes, standard pipe lists, 8—12-inch, no extra.

Boiler Tubes

C. L. Discounts, f.o.b. Pitts.

Lap Weld Steel		*Charcoal Iron*	
2—2¼	33	1¾	8
2½—2¾	40	2—2¼	13
3	47	2½—2¾	16
3¼—3½	50	3	17
4	52	3¼—3½	18
4½—5	42	4	20
		4½	21

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 points under base.

Seamless Boiler Tubes

Under date of May 15 in lots of 40,000 pounds or more for cold-drawn boiler tubes and in lots of 40,000 pounds or feet or more for hot-finished boiler tubes revised prices are quoted for 55 cold-drawn boiler tube sizes ranging from ¼ to 6-inch outside diameter in 30 wall thicknesses, decimal equivalent from 0.035 to 1.000, on a dollars and cents basis per 100 feet and per pound. Less-carloads revised as of July 1, 1935, card.

Hot-finished carbon steel boiler tube prices also under date of May 15 range from 1 through 7 inches outside diameter, inclusive, and embrace 47 size classifications in 22 decimal wall thicknesses ranging from 0.109 to 1.000, prices also being on a lb. and 100 ft. basis.

Seamless Tubing

Cold drawn; f.o.b. mill disc.

100 ft. or 150 lbs.	32%
15,000 ft. or 22,500 lbs.	70%

Cast Iron Water Pipe

Class B Pipe—Per Net Ton

6-in. & over, Birm.	$39.00-40.00
4-in., Birmingham	42.00-43.00
4-in., Chicago	50.40-51.40
6 to 24-in. Chicago	47.40-48.40
6-in. & over, east. fdy.	43.00
Do., 4-in.	46.00
Class A pipe $3 over Class B	
Stnd. fitgs., Birm. base	$100.00

Semifinished Steel

Billets and Blooms

4 x 4-inch base; gross ton

Pitts., Chi., Cleve., and Youngstown	$29.00
Philadelphia	34.67
Duluth	31.00

Forging Billets

6 x 6 to 9 x 9-in., base

Pitts., Chi., Buff.	35.00
Forging, Duluth	37.00

Sheet Bars

Pitts., Cleve., Young., Chi., Buff., Canton, Sparrows Pt.	30.00

Slabs

Pitts., Chi., Cleve., Young.	29.00

Wire Rods

(Common; combination up $2)

Pitts., Cleveland	40.00
Chicago	41.00
Worcester, Mass.	42.00

Skelp

Pitts., Chi., Young., Buff., Coatesville, Sparrows Point	1.80c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$3.50-3.65
Connellsville, fdry.	4.00-4.25
Connel., prem. fdry.	5.50-5.75
New River fdry.	6.00
Wise county fdry.	4.45-5.00
Wise county fur.	4.00-4.50

By-Product Foundry

Newark, N. J., del.	9.20-9.65
Chi., ov., outside del.	9.00
Chicago, del.	9.75
New England, del.	11.50
St. Louis, del.	10.00
Birmingham, ovens	6.50
Indianapolis, del.	9.40
Cincinnati, del.	9.50
Cleveland, del.	9.75
Buffalo, ovens	7.50-8.00
Detroit, ov., out. del.	9.00
Philadelphia, del.	9.03

Coke By-Products

Per gallon, producers' plants.

Tank lots	Spot
Pure and 90% benzol	18.00c
Toluol	30.00c
Solvent naphtha	30.00c
Commercial xylol	30.00c

Per lb. f.o.b. New York.

Phenol (200 lb. drums)	16.30c
Do. (100 lbs.)	17.30c

Eastern Plants, per lb.

Naphthalene flakes and balls, in bbls., to jobbers	6.75c

Per 100 lb. Atlantic seaboard

Sulphate of ammonia	$1.20

†Western prices, ½-cent up.

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25; 50c diff. for each 0.25 below 1.75. Gross tons.

Basing Points:	No. 2 Fdry	Malleable	Basic	Bessemer
Bethlehem, Pa.	$20.50	$21.00	$20.00	$21.50
Birdsboro, Pa.	20.50	21.00	20.00	21.50
Birmingham, Ala., southern del.	15.50	15.50	14.50	21.00
Buffalo	19.50	20.00	18.50	20.50
Chicago	19.50	19.50	19.00	20.00
Cleveland	19.50	19.50	19.00	20.00
Detroit	19.50	19.50	19.00	20.00
Duluth	20.00	20.00	.....	20.50
Erie, Pa.	19.50	20.00	19.00	20.50
Everett, Mass.	20.50	21.00	20.00	21.50
Hamilton, O.	19.50	19.50	19.00	.....
Jackson, O.	20.25	20.25	19.75	.....
Neville Island, Pa.	19.50	19.50	19.00	20.00
Provo, Utah	17.50	.....	17.00	.....
Sharpsville, Pa.	19.50	19.50	19.00	20.00
Sparrows Point, Md.	20.50	.....	20.00	.....
Swedeland, Pa.	20.50	21.00	20.00	21.50
Toledo, O.	19.50	19.50	19.00	20.00
Youngstown, O.	19.50	19.50	19.00	20.00
Delivered from Basing Points:				
Akron, O., from Cleveland	20.76	20.76	26.26	21.26
Baltimore from Birmingham	21.08	.....	19.96	.....
Boston from Birmingham	20.62	.....	20.50	.....
Boston from Everett, Mass.	21.00	21.50	20.50	22.00
Boston from Buffalo	21.00	21.50	20.50	22.00
Brooklyn, N. Y., from Bethlehem	22.93	23.43	.....	.....
Brooklyn, N. Y., from Bmghm.	22.50	.....	.....	.....
Canton, O., from Cleveland	20.76	20.76	20.26	21.26
Chicago from Birmingham	†19.72	.....	19.60	.....
Cincinnati from Hamilton, O.	20.58	20.58	20.08	.....
Cincinnati from Birmingham	20.20	.....	19.20	.....
Cleveland from Birmingham	19.62	.....	19.12	.....
Indianapolis from Hamilton, O.	21.93	21.93	21.43	22.43
Mansfield, O., from Toledo, O.	21.26	21.26	20.76	21.76
Milwaukee from Chicago	20.57	20.57	20.07	21.07
Muskegon, Mich., from Chicago or Toledo or Detroit	22.60	22.60	22.10	23.10
Newark, N. J., from Birmingham	21.61	.....	.....	.....
Newark, N. J., from Bethlehem	21.99	22.49	.....	.....
Philadelphia from Birmingham	20.93	.....	20.81	.....
Philadelphia from Swedeland, Pa.	21.31	21.81	20.81	.....
Pittsburgh district from Neville Island	Neville base plus 67c, 81c and $1.21 switching charges			
Saginaw, Mich., from Detroit	21.75	21.75	21.25	21.25

Delivered from Basing Points:	No. 2 Fdry	Malleable	Basic	Bessemer
St. Louis, northern	20.00	20.00	19.50	.....
St. Louis from Birmingham	†19.62	.....	19.50	.....
St. Paul from Duluth	21.94	21.94	.....	22.44

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Standish, N. Y., $24.00, Phila. base, standard and copper bearing, $25.13.

Gray Force		Charcoal	
Valley furnace	19.00	Lake Superior fur.	$22.00
Pitts. dist. fur.	19.00	Do., del. Chicago	25.25
		Lyles, Tenn.	22.50

Silvery†

Jackson county, O., base; 6-6.50 per cent $22.75; 6.51-7—$23.25; 7-7.50—$23.75; 7.51-8—$24.25; 8-8.50—$24.75; 8.51-9—$25.25; 9-9.50—$25.75. Buffalo $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base: Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon. 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$55.00

First Quality

Pa., Ill., Md., Mo.	$45.00
Alabama, Ga., Ky.	$40.00-45.00

Second Quality

Pa., Ill., Ky., Md., Mo.	40.00
Ga., Ala.	35.00

Ohio

First quality	$40.00
Intermediary	37.00
Second quality	28.00

Malleable Bung Brick

All bases	50.00

Silica Brick

Pennsylvania	$45.00
Joliet, E. Chicago	54.00
Birmingham, Ala.	52.00

Magnesite

Imported dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Domestic dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	40.00
Domestic dead-burned gr. net ton f.o.b. Chewelah, Wash. (bulk)	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$45.00
Chemically bonded chrome brick	45.00
Magnesite brick	65.00
Chemically bonded magnesite brick	55.00

Fluorspar, 85-5

Washed gravel, duty paid, tide, net ton	$20.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all-rail	$16.00
Do., for barge	$17.50

Ferroalloys

Dollars, except Ferrochrome

*Ferromanganese, 78-82% tidewater, duty paid	75.00
Do., Balti. base	75.00
Do., del. Pittsb'gh	80.13
Spiegeleisen, 19-20% dom. Palmerton, Pa., spot†	26.00
Do., New Orleans	26.00
Ferrosilicon, 50% freight all., cl.	77.50
Do., less carload	85.00
Do., 75 per cent	125-130.00

Spot, $5 a ton higher.

*Silicoman., 2½ carb. 2% carbon, 95.00; 1%,	85.00 100.00
Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. del.	10.00
Ferrotungsten, stand., lb. con. del.	1.35- 1.45
Ferrovanadium, 35 to 40% lb., cont.	2.70- 2.90
Ferrotitanium, c. l., prod. plant, frt. allow., net ton	137.50
Spot, 1 ton, frt. allow., lb.	7.00
Do., under 1 ton	7.50
Ferrophosphorus, per ton, c. l., 17-19% Rockdale, Tenn., basis, 18%, $2 unitage	50.00
Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage	65.00
Ferromolybdenum, stand. 55-65%, lb.	0.95
Molybdate, lb. cont.	0.80

†Carloads, Quan. diff. apply.

Nonferrous

METAL PRICES OF THE WEEK

Spot unless otherwise specified. Cents per pound

	Copper: Electro, del. Conn.	Copper: Lake, del. Midwest	Copper: Casting, refinery	Straits Tin: New York Spot	Straits Tin: New York Futures	Lead: New York	Lead: East St. L.	Zinc: St. L.	Aluminum 99%	Antimony: Chinese Spot, N. Y.	Nickel: Cathodes
Dec. 28	9.25	9.37½	8.85	48.50	47.25	4.50	4.35	4.85	*19.00	14.00	35.00
Dec. 30	9.25	9.37½	8.85	48.60	47.30	4.50	4.35	4.85	*19.00	14.00	35.00
Dec. 31	9.25	9.37½	8.85	48.60	47.25	4.50	4.35	4.85	*19.00	14.00	35.00
Jan. 1—Holiday											

Nominal

MILL PRODUCTS

F.o.b. mill base, cents per lb. except as specified. Copper brass products based on 9.00c Conn. copper.

Sheets	
Yellow brass (high)	14.62½
Copper hot rolled	16.25
Lead cut to jobbers	8.25
Zinc, 100-lb. base	9.50
Tubes	
High yellow brass	16.62½
Seamless copper	16.75
Rods	
High yellow brass	13.12½
Copper, hot rolled	13.50
Anodes	
Copper untrimmed	14.00
Wire	
Yellow brass (high)	15.12½

OLD METALS

Dealers' buying prices, cents lb.

No. 1 Composition Red Brass	
New York	5.75- 6.00
Cleveland	6.50- 6.75
Chicago	6.00- 6.12½
St. Louis	6.00- 6.25
Heavy Copper and Wire	
New York, No. 1	7.00- 7.25
Chicago, No. 1	7.00- 7.25
Cleveland	6.75- 7.00
St. Louis, No. 1	7.00- 7.37½
Composition Brass Borings	
New York	5.00- 5.25
Light Copper	
New York	5.75- 6.00
Chicago	5.50- 5.75
Cleveland	6.00- 6.25
St. Louis	5.75- 6.00
Light Brass	
Chicago	3.37½-3.62½
Cleveland	3.25- 3.50
St. Louis	3.50- 3.75
Lead	
New York	3.50- 3.75
Cleveland	3.50- 3.75
Chicago	3.37½-3.62½
St. Louis	3.65- 3.75
Zinc	
New York	2.00- 2.25
Cleveland	2.50- 2.75
St. Louis	2.75-3.00
Aluminum	
Borings, Cleveland	9.00- 9.50
Mixed, cast, Cleve.	13.25-13.50
Mixed, cast, St. L.	13.00-13.50
Clips, soft, Cleve.	15.00-15.25

SECONDARY METALS

Brass ingot, 85-5-5-5	9.50
Stand. No. 12 alum.	17.00-17.50

Iron and Steel Scrap Prices

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated

HEAVY MELTING STEEL

Birmingham	8.50- 9.50
Boston, dock, expt.	9.50- 9.75
Boston, domestic	7.50- 7.75
Buffalo, No. 1	12.00-12.50
Buffalo, No. 2	11.00-11.50
Chicago, No. 1	13.00-13.50
Cleveland, No. 1	12.75-13.25
Cleveland, No. 2	11.75-12.25
Detroit, No. 1	10.00-10.50
Detroit, No. 2	8.50- 9.00
Eastern Pa., No. 1	12.00-12.50
Eastern Pa. No. 2	11.00-11.50
Federal, Ill.	10.00-10.50
Granite City, R. R.	10.50-11.00
Granite City, No. 2	9.25- 9.75
N. Y., deal. No. 2	7.50- 8.00
N. Y., deal. barge	8.50 9.00
Pitts., No. 1 (R. R.)	14.50-15.00
Pitts., No. 1 (dlr.)	14.25-14.75
Pittsburgh, No. 2	13.00-13.50
St. Louis	9.25- 9.75
Valleys, No. 1	13.50-14.00

COMPRESSED SHEETS

Buffalo, dealers	11.00-11.50
Chicago, factory	12.00-12.50
Chicago, dealer	11.50-12.00
Cleveland	12.25-12.75
Detroit	10.00-10.50
E. Pa., new mat.	11.50-12.00
Pittsburgh	14.25-14.75
St. Louis	7.00- 7.50
Valleys	13.00-13.25

BUNDLED SHEETS

Buffalo	9.00- 9.50
Cincinnati, del.	8.00- 8.50
Cleveland	9.75-10.25
Pittsburgh	13.00-13.50
St. Louis	5.50- 6.05

SHEET CLIPPINGS, LOOSE

Chicago	7.50- 8.00
Cincinnati	7.50- 8.00
Detroit	7.50- 8.00
St. Louis	5.00- 5.50

STEEL RAILS, SHORT

Birmingham	12.00-12.50
Buffalo	14.50-15.00
Chicago (3 ft.)	15.00-15.50
Chicago (2 ft.)	15.75-16.25
Cincinnati, del.	14.00-14.50
Detroit	13.50-14.00
Pitts., open-hearth, 3 ft. and less	15.25-15.75
St. Louis, 2 ft. & less	14.00-14.50

STEEL RAILS, SCRAP

Boston	7.50- 7.75
Chicago	13.00-13.25
Pittsburgh	14.50-15.00
St. Louis	11.50-12.00
Buffalo	12.00-12.50

STOVE PLATE

Birmingham	7.00- 7.50
Boston, dealers	4.75- 5.00
Buffalo	10.25-10.75
Chicago	7.00- 7.50
Cincinnati, dealers	7.50- 8.00
Detroit, net	7.00- 7.50
Eastern Pa.	9.50- 9.75
N. Y., deal. fdry.	6.25- 6.75
St. Louis	7.00- 7.50

COUPLERS, SPRINGS

Buffalo	14.50-15.00
Chicago, springs	14.00-14.50
Eastern Pa.	15.50-16.00
Pittsburgh	16.00-16.50
St. Louis	12.00-12.50

ANGLE BARS—STEEL

Chicago	14.00-14.50
St. Louis	12.25-12.75

RAILROAD SPECIALTIES

Chicago	14.00-14.50

LOW PHOSPHORUS

Buffalo, billet and bloom crops	14.50-15.00
Cleveland, billet, bloom crops	16.00-16.50
Eastern Pa., crops	15.50-16.00
Pittsburgh, billet, bloom crops	17.00-17.50
Pittsburgh, sheet bar crops	15.75-16.25

FROGS, SWITCHES

Chicago	13.00-13.50
St. Louis, cut	11.50-12.00

SHOVELING STEEL

Chicago	13.00-13.50
Federal, Ill.	9.75-10.25
Granite City, Ill.	8.75- 9.25

RAILROAD WROUGHT

Birmingham	7.00- 7.50
Boston, dealers	6.00- 6.50
Buffalo, No. 1	11.00-11.50
Buffalo, No. 2	12.00- 12.50
Chicago, No. 1, net	10.00-10.50
Chicago, No. 2	13.00-13.50
Cincinnati, No. 2	10.50-11.00
Eastern Pa.	12.50-13.00
N. Y., No. 1 deal	9.50-10.00
St. Louis, No. 1	7.75- 8.25
St. Louis, No. 2	10.50-11.00

SPECIFICATION PIPE

Eastern Pa.	10.50
New York, dealers	3.50- 4.00

BUSHELING

Buffalo, No. 1	11.00-11.50
Chicago, No. 1	12.00-12.50
Cinci., No. 1, deal	7.50- 8.00
Cincinnati, No. 2	4.50- 5.00
Cleveland, No. 2	7.50- 8.00
Detroit, No. 1, new	9.50-10.00
Valleys, new, No. 1	12.75-13.00

MACHINE TURNINGS

Birmingham	4.00- 4.50
Boston, dealers	3.50- 3.75
Buffalo	5.75- 6.25
Chicago	7.50- 8.00
Cincinnati, dealers	6.00- 6.50
Cleveland	7.00- 7.50
Detroit	5.50- 6.00
Eastern Pa.	7.50- 8.00
New York, dealers	3.50- 4.00
Pittsburgh	9.75-10.25
St. Louis	3.25- 3.75
Valleys	9.00- 9.50

BORINGS AND TURNINGS

For Blast Furnace Use

Boston, dealers	2.50- 2.75
Buffalo	7.75- 8.25
Cincinnati, dealers	5.50- 6.00
Cleveland	7.50- 8.00
Detroit	5.50- 6.00
Eastern Pa.	6.00- 6.50
New York, dealers	2.00- 2.50
Pittsburgh	8.00- 9.00

CAST IRON BORINGS

Birmingham, plain	4.00- 4.50
Boston, chemical	5.50- 6.50
Boston, dealers	3.25- 3.50
Buffalo	7.75- 8.25
Chicago	6.00- 6.50
Cincinnati, dealers	5.50- 6.00
Cleveland	7.50- 8.00
Detroit	5.50- 6.00
E. Pa., chemical	10.00-12.00
New York, dealers	2.00- 2.50
St. Louis	3.75- 4.25

PIPE AND FLUES

Cincinnati, dealers	7.00- 7.50

RAILROAD GRATE BARS

Buffalo	8.50- 9.00
Chicago, net	7.50- 8.00
Cincinnati	6.00- 6.50
Eastern Pa.	9.50- 9.75
New York, dealers	5.00- 5.25
St. Louis	5.00- 5.50

FORGE FLASHINGS

Boston, dealers	6.50- 6.75
Buffalo	11.00-11.50
Cleveland	11.00-11.50
Detroit	9.00- 9.50
Pittsburgh	13.00-13.50

FORGE SCRAP

Boston, dealers	4.50- 5.00
Chicago, heavy	14.00-14.50
Eastern Pa.	12.25-12.75

ARCH BARS, TRANSOMS

St. Louis	12.25-12.75

AXLE TURNINGS

Boston, dealers	3.75- 4.25
Buffalo	10.50-11.00
Chicago, elec. fur	12.50-13.00
Eastern Pa.	11.00
St. Louis	8.50- 9.00

STEEL CAR AXLES

Birmingham	12.00-12.50
Boston, ship. point	10.50-11.00
Buffalo	14.50-15.00
Chicago, net	14.50-15.00
Eastern Pa.	17.00
St. Louis	12.75-13.25

SHAFTING

Boston, ship. point	13.00-13.25
Eastern Pa.	18.50
New York, dealers	13.50-14.00
St. Louis	13.00-13.50

CAR WHEELS

Birmingham	9.00- 9.50
Boston, iron deal	7.00- 7.75
Buffalo, iron	11.00-11.50
Buffalo, steel	14.50-15.00
Chicago, iron	13.00-13.50
Chicago, rolled steel	14.00-14.50
Cincinnati, iron	10.50-11.00
Eastern Pa., iron	13.50
Eastern Pa., steel	15.50-16.00
Pittsburgh, iron	14.00-14.50
Pittsburgh, steel	15.75-16.25
St. Louis, iron	10.25-10.75
St. Louis, steel	12.00-12.50

NO. 1 CAST SCRAP

Birmingham	9.00 9.50
Boston, No. 1 mach.	9.00- 9.25
Boston, No. 2	8.25- 8.50
Boston, tex. con.	8.50- 9.00
Buffalo, cupola	11.50-12.00
Buffalo, mach.	12.50-13.00
Chicago, agri. net	10.00-10.50
Chicago, auto	11.00-11.50
Chicago, mach. net	12.00-12.50
Chicago, railr'd net	10.50-11.00
Cinci., mach. cup	10.50-11.00
Cleveland, cupola	12.75-13.25
Detroit, net	11.50-12.00
Eastern Pa., cupola	12.50-13.00
E. Pa., mixed yard	10.50
Pittsburgh, cupola	13.75-14.25
San Francisco, del.	13.50-14.00
Seattle	7.50- 9.00
St. Louis, No. 1	10.75-11.25
St. L., No. 1 mach.	12.50-13.00

HEAVY CAST

Boston, del.	6.75- 7.00
Buffalo, break.	10.25-10.75
Cleveland, break	10.50-11.00
Detroit, No. 1 mach. net	12.00-12.50
Detroit, break.	9.00- 9.50
Detroit, auto net	11.50-12.00
Eastern Pa.	12.00-12.50
N. Y., break. deal	7.50- 8.00
Pittsburgh	12.50-13.00

MALLEABLE

Birmingham, R. R.	11.50-12.50
Boston, consum.	13.50-14.50
Buffalo	14.75-15.25
Chicago, R. R.	15.75-16.25
Cincinnati, agri. del.	11.50-12.00
Cleveland, rail	16.00-16.50
Detroit, auto net	13.00-13.50
Pittsburgh, rail	16.50-17.00
St. Louis, R. R.	13.75-14.25
Eastern Pa., R. R.	15.00-15.50

RAILS FOR ROLLING

5 feet and over

Birmingham	10.50-11.00
Boston, dealers	8.00- 8.50
Buffalo	12.00-12.50
Chicago	14 00-14.50
Eastern Pa.	13.00-14.00
New York, dealer	10.50-11.00
St. Louis	13.50-14.00

LOCOMOTIVE TIRES

Chicago (cut)	14.00-14.50
St. Louis, No. 1	11.75-12.25

LOW PHOS. PUNCHINGS

Buffalo	14.50-15.00
Chicago	15.50-16.00
Eastern Pa.	15.00-15.50
Pittsburgh (heavy)	16.00-16.50
Pittsburgh (light)	15.50-16.00

Iron Ore

Lake Superior Ore

Gross ton, 51½% Lower Lake Ports

Old range bessemer	$4.80
Mesabi nonbess.	4.50
High phosphorus	4.40
Mesabi bessemer	4.65
Old range nonbess.	4.65

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63% con. (nom.)	8.00- 9.00
Con.-free low phos. 58-60% (nom.)	10.00-10.50

Foreign Ore

Cents per unit, f.a.s. Atlantic ports (nominal)

Foreign manganiferous ore, 45.55% iron, 6-10% man.	10.50
No. Afr. low phos.	10.50
Swedish basic, 65%	9.50
Swedish low phos.	10.50
Spanish No. Africa basic, 50 to 60%	10.50
Tungsten, spot sh. ton unit, duty pd.	$15.85-16.00
N. F., fdy., 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	19.25

Manganese Ore

(Nominal)

Prices not including duty, cents per unit cargo lots

Caucasian, 52-55%	26.00
So. African, 52%	26.00
So. Afr., 49-51%	24.00
Indian, 58-60%	nominal
Indian, 48-50%	nominal

Warehouse Iron and Steel Prices

Cents per pound for delivery within metropolitan districts of cities specified

STEEL BARS

Baltimore*	3.00c
Boston††	3.00c
Buffalo	3.00c
Chattanooga	3.36c
Chicago (j)	3.00c
Cincinnati	3.22c
Cleveland	3.00c
Detroit	3.09c
Houston	3.00c
Los Angeles	3.60c
Milwaukee	3.06c
New Orleans	3.35c
New York‡ (d)	3.31c
Pitts. (h)	2.95c-3.10c
Philadelphia*	3.03c
Portland	3.70c
San Francisco	3.50c
Seattle	3.70c
St. Louis	3.25c
St. Paul	3.25c-3.40c
Tulsa	3.25c

IRON BARS

Portland	3.40c
Chattanooga	3.36c
Baltimore*	3.05c
Chicago	2.75c
Cincinnati	3.22c
New York‡ (d)	3.36c
Philadelphia*	2.93c
St. Louis	3.20c
Tulsa	3.25c

REINFORCING BARS

Buffalo	2.60c
Chattanooga	3.36c
Chicago	2.10c-2.60c
Cleveland (c)	2.10c
Cincinnati	3.25c
Houston	3.25c
Los Ang., cl.	2.45c
New Orleans	3.50c
Pitts., plain (h)	3.05c
Pitts., twisted squares (h)	3.175c
San Francisco	2.45c
Seattle	2.45c
St. Louis	3.25c
Tulsa	3.25c
Young.	2.30c-2.60c

SHAPES

Baltimore*	3.00c
Boston††	3.19c
Buffalo	3.25c
Chattanooga	3.56c
Chicago	3.20c
Cincinnati	3.42c
Cleveland	3.31c
Detroit	3.42c
Houston	3.00c
Los Angeles	3.60c
Milwaukee	3.31c
New Orleans	3.55c
New York (d)	3.46c
Philadelphia*	2.98c
Pittsburgh (h)	3.15c
Portland (i)	3.70c
San Francisco	3.50c
Seattle (i)	3.70c
St. Louis	3.45c
St. Paul	3.45c
Tulsa	3.50c

PLATES

Baltimore*	3.00c
Boston††	3.21c
Buffalo	3.37c
Chattanooga	3.56c
Chicago	3.20c
Cincinnati	3.42c
Cleveland, ¼-in. and over	3.31c
Detroit	3.42c
Detroit, $\frac{3}{16}$-in.	3.65c
Houston	3.00c
Los Angeles	3.60c
Milwaukee	3.31c
New Orleans	3.55c
New York (d)	3.40c
Philadelphia*	2.98c
Phila. floor	4.95c
Pittsburgh (h)	3.15c
Portland	3.55c
San Francisco	3.50c
Seattle	3.55c
St. Louis	3.45c
St. Paul	3.45c
Tulsa	3.50c

NO. 10 BLUE

Baltimore*	3.10c
Boston††	3.30c
Buffalo	3.62c
Chattanooga	3.36c
Chicago	3.05c
Cincinnati	3.22c
Cleveland	3.11c
Det., 8-10 ga.	3.14c
Houston	3.35c
Los Angeles	3.70c
Milwaukee	3.16c
New Orleans	3.55c
New York	3.31c
Portland	3.75c
Philadelphia*	3.08c
Pittsburgh (h)	2.95c
San Francisco	3.60c
Seattle	3.75c
St. Louis	3.45c
St. Paul	3.30c
Tulsa	3.70c

NO. 24 BLACK

Baltimore*†	3.60c
Boston (g)	2.95c
Buffalo	3.25c
Chattanooga	4.16c
Chicago	3.85c
Cincinnati	4.02c
Cleveland	3.91c
Detroit	3.94c
Los Angeles	4.35c
Milwaukee	3.96c
New Orleans	4.50c
New York	3.89c
Philadelphia*†	3.60c
Pitts.** (h)	3.55c
Portland	4.40c
San Francisco	4.25c
Seattle	4.40c
St. Louis	4.10c
St. Paul	3.90c
Tulsa	4.75c

NO. 24 GALV. SHEETS

Baltimore*†	4.30c
Buffalo	4.00c
Boston (g)	4.65c
Chattanooga	4.86c
Chicago (h)	4.55c
Cincinnati	4.72c
Cleveland	4.61c
Detroit	4.72c
Houston	4.40c
Los Angeles	4.95c
Milwaukee	4.66c
New Orleans	4.95c
New York	4.50c
Philadelphia*†	4.40c
Pitts.** (h)	4.15-4.45c
Portland	5.00c
San Francisco	5.00c
Seattle	5.00c
St. Louis	4.65c
St. Paul	4.50c
Tulsa	5.10c

BANDS

Baltimore*	3.20c
Boston††	3.30c
Buffalo	3.42c
Chattanooga	3.61c
Chicago	3.30c
Cincinnati	3.47c
Cleveland	3.36c
Detroit, $\frac{3}{16}$-in. and lighter	3.39c
Houston	3.25c
Los Angeles	4.10c
Milwaukee	3.41c
New Orleans	3.95c
New York (d)	3.56c
Philadelphia	3.18c
Pittsburgh (h)	3.20c
Portland	4.25c
San Francisco	4.10c
Seattle	4.25c
St. Louis	3.55c
St. Paul	3.55c
Tulsa	3.45c

HOOPS

Baltimore	2.30c
Boston	4.30c
Buffalo	3.42c
Chicago	3.30c
Cincinnati	3.47c
Det., No. 14 and lighter	3.39c
Los Angeles	5.85c
Milwaukee	3.41c
New York	3.56c
Philadelphia	3.43c
Pittsburgh (h)	3.70c
Portland	5.60c
San Francisco	6.15c
Seattle	5.60c
St. Louis	3.55c
St. Paul	3.55c

COLD FIN. STEEL

Baltimore (c)	3.73c
Boston	3.90c
Buffalo (h)	3.55c
Chattanooga*	4.13c
Chicago (h)	3.50c
Cincinnati	3.72c
Cleveland (h)	3.50c
Detroit	3.79c
Los Ang. (f) (d)	6.00c
Milwaukee	3.61c
New Orleans	4.30c
New York	3.96c
Philadelphia	3.76c
Pittsburgh	3.50c
Portland (f) (d)	6.15c
San Fran. (f) (d)	5.95c
Seattle (f) (d)	6.15c
St. Louis	3.75c
St. Paul	4.02c
Tulsa	4.65c

COLD ROLLED STRIP

Boston, 0.100-in., 500 lb. lots	3.245c
Buffalo	3.39c
Chicago	3.27c
Cincinnati (b)	3.22c
Cleveland (b)	3.20c
Detroit	3.33c
New York	3.36c
St. Louis	3.45c

TOOL STEELS

(Applying on or east of Mississippi river; west of Mississippi 1c up)

	Base
High speed	57c
High carbon, high chrome	37c
Oil hardening	22c
Special tool	20c
Extra tool	17c
Regular tool	14c

Uniform extras apply.

BOLTS AND NUTS

(100 pounds or over)

	Discount
Chicago (a)	70
Cleveland	70
Detroit	70-10
Milwaukee	70
Pittsburgh	70

(a) Under 100 pounds, 65 off.

(b) Plus straightening, cutting and quantity differentials; (c) Plus mill, size and quantity extras; (d) Minus quant. diff.; (e) New mill classif. (f) Rounds only; (g) 50 bundles or over; (h) Outside delivery, 10c less; (i) Under 3 in.; (j) shapes other than rounds, flats, fillet angles, 3.15c.

‡Domestic bars; *Plus quan. extras; **Under 25 bundles; *†50 or more bundles; † New extras apply; ††Base 40,000 lbs., extras on less.

Prices on heavier lines are subject to new quantity differentials; 399 lbs. and less, up 50 cts.; 400 to 9999 lbs., base; 10,000 to 19,999 lbs., 15 cts. under; 20,000 to 39,999 lbs., 25 cts. under; 40,000 lbs. and over, 35 cts. under base.

Current Iron and Steel Prices of Europe

Dollars at Rates of Exchange, Jan. 2

Export Prices f. o. b. Ship at Port of Dispatch—(By Cable or Radio)

	British gross tons U. K. ports		Continental Channel or North Sea ports, metric tons	
			Quoted in dollars at current value	**Quoted in gold pounds sterling
PIG IRON	£ s d			£ s d
Foundry, 2.50-3.00 Silicon	$15.37	3 2 6	$14.41	1 16 0
Basic bessemer	15.37	3 2 6*	12.95	1 12 0
Hematite, Phos. .03-.05	16.00	3 5 0	.....	.....
SEMIFINISHED STEEL				
Billets	$27.06	5 10 0	$19.02	2 7 0
Wire rods, No. 5 gage	41.82	8 10 0	36.44	4 10 0
FINISHED STEEL				
Standard rails	$40.59	8 5 0	$44.53	5 10 0
Merchant bars	1.64c	7 10 0	1.15c to 1.20c	3 2 6 to 3 5 0
Structural shapes	1.64c	7 10 0	1.14c	3 1 6
Plates, †¼ in. or 5 mm.	1.77c	8 1 3	1.56c	4 5 0
Sheets, black, 24 gage or 0.5 mm.	2.09c	9 10 0	2.15c	5 16 0††
Sheets, gal., 24 gage, corr.	2.52c	11 10 0	2.19c	6 0 0
Bands and strips	1.86c	8 10 0	1.46c	4 0 0
Plain wire, base	2.03c	9 5 0	1.96c	5 7 6
Galvanized wire, base	2.36c	10 15 0	2.29c to 2.33c	6 5 6 to 6 7 6
Wire nails, base	2.63c	12 0 0	2.11c	5 15 0
Tin plate, box 108 lbs.	$4.62	0 18 9	.....	.....

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 0s 0d $(43.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

		£ s d		French Francs		Belgian Francs		Reich Marks
Fdy. pig iron, Si. 2.5	$17.22	3 10 0(a)	$17.13	260	$12.85	385	$25.36	63
Basic bessemer pig iron	17.22	3 10 0(a)	12.52	190	11.83	350	27.97	(b)69.50
Furnace coke	4.68	0 19 0	6.26	95	3.89	115	7.65	19
Billets	27.06	5 10 0	28.34	430	18.25	540	38.85	96.50
Standard rails	1.81c	8 5 0	2.00c	671	1.65c	1,100	2.42c	132
Merchant bars	1.90c	8 12 0	1.68c	560	90c	600	2.01c	110
Structural shapes	1.92c	8 15 0	1.65c	550	90c	600	1.97c	107.50
Plates, †¼-in. or 5 mm.	1.99c	9 1 3	2.10c	700	1.05c	700	2.32c	127
Sheets, black	2.47c	11 5 0§	1.73c	600‡	1.24c	825‡	2.64c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	2.91c	13 5 0	3.00c	1,000	2.25c	1,500	6.77c	370
Plain wire	2.09c	9 10 0	2.64c	900	1.75c	1,150	3.17c	175
Bands and strips	2.05c	9 7 0	1.95c	650	1.26c	840	2.32c	127

*Basic. †British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 5 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. a del. Middlesbrough. b hematite. ††Close annealed.

**Gold pound sterling carries a premium of 66.25 per cent over paper sterling.

1935 Pig Iron Output Best in 5 Years; December Rate Down

PRODUCTION of coke pig iron in the United States in 1935 totaled 21,041,521 gross tons, an output which was the highest for any year since 1930 with 31,441,488 tons. As compared with 1934 with 15,977,679 tons, the 1935 figure was an increase of 5,063,842 tons, or 31.7 per cent. Pig iron production aggregated 13,221,707 gross tons in 1933; 8,674,067 tons in 1932; and 18,263,011 tons in 1931.

In December, production amounted to 2,116,534 gross tons, a gain of 50,241 tons, or 8.4 per cent, over the November total of 2,066,293 tons. December was a 1-day longer month than November. This was the highest December since 1929 with 2,836,917 tons and the highest for any month since October, 1930, with 2,165,374 tons. The figure for December, 1934, was 1,028,006 tons.

Average daily production in December was 68,275 gross tons, this being a loss of 601 tons per day, or 0.87 per cent, from the November daily rate of 68,876 tons. Thus was broken the upward movement which started last August. Average daily production in December, a year ago, was 33,161 tons.

Relating production to capacity, operations in December were at a rate of 49.0 per cent, as compared with 49.5 per cent in November, and 23.7 per cent in December, 1934.

Active blast furnaces on Dec. 31 totaled 119, this being a drop of 3 stacks from the 122 making iron on the last day of November. The November total, incidentally, was the highest point reached in 1935, and the best for any month since September 1930 with 126. Only 67 furnaces were active on Dec. 31, 1934. During December, 3 steelworks or nonmerchant stackes resumed and 5 were blown out or banked; of the merchant class, none was blown in and 1 was made inactive.

Blast furnaces resuming in December were: In Ohio: Youngstown A, Youngstown Sheet & Tube Co. In Alabama: Ensley No. 6, Tennessee Coal, Iron & Railroad Co. In Indiana: Gary No. 6, Carnegie-Illinois Steel Corp.

Stacks blowing out or banking were: In Ohio: Lorain No. 5, National Tube Co. In Pennsylvania: two Eliza, Jones & Laughlin Steel Corp. In New York: Buffalo No. 1, Republic Steel Corp.; Troy, Troy Furnace Corp. In Maryland: Maryland B, Bethlehem Steel Co.

MONTHLY IRON PRODUCTION

Gross Tons

	1935	1934	1933
Jan.	1,478,443	1,225,643	568,785
Feb.	1,614,905	1,270,792	553,067
Mar.	1,770,990	1,625,588	542,013
Apr.	1,671,556	1,736,217	623,606
May	1,735,577	2,057,471	892,326
June	1,558,463	1,936,897	1,264,953
July	1,520,340	1,228,544	1,801,345
Aug.	1,759,782	1,060,187	1,833,265
Sept.	1,770,259	899,075	1,507,931
Oct.	1,978,379	951,353	1,358,540
Nov.	2,066,293	957,906	1,083,740
Dec.	2,116,534	1,028,006	1,192,136
Total	21,041,521	15,977,679	13,221,707

AVERAGE DAILY PRODUCTION

Gross Tons

	1935	1934	1933	1932
Jan.	47,692	39,537	18,348	31,336
Feb.	57,675	45,385	19,752	33,122
Mar.	57,120	52,438	17,484	31,194
Apr.	55,719	57,873	20,786	28,524
May	55,986	66,370	28,784	25,282
June	51,949	64,563	42,165	20,867
July	49,043	39,630	58,108	18,294
Aug.	56,767	34,199	59,137	17,035
Sept.	59,009	29,969	50,264	19,788
Oct.	63,818	30,689	43,824	20,795
Nov.	68,876	31,930	36,124	20,858
Dec.	68,275	33,161	38,456	17,650
Ave.	57,697	43,774	36,223	23,699

DECEMBER IRON PRODUCTION

	No. in blast Last day of Dec.	Nov.	Total tonnage Merchant	Nonmerchant
Ohio	29	29	86,381	462,302
Penna.	35	37	87,458*	456,830*
Alabama	12	11	100,811*	64,563*
Illinois	10	10	56,725	150,020
New York	8	10	59,528	103,206
Colorado	1	1		
Indiana	10	9	13,078*	301,328
Maryland	3	4		
Virginia	1	1		
Kentucky	1	1		
Mass.	0	0		
Tenn.	0	0		
Utah	1	1	6,977	167,327
West Va.	3	3		
Michigan	4	4		
Minnesota	1	1		
Missouri	0	0		
Total	119	122	410,958*	1,705,576*

*Includes ferro and spiegeleisen.

RATE OF OPERATION

(Relation of Production to Capacity)

	1935[1]	1934[2]	1933[3]	1932[4]
Jan.	34.2	28.3	13.3	22.1
Feb.	41.4	32.5	14.3	23.4
Mar.	41.0	37.5	12.7	22.0
Apr.	40.0	41.4	15.1	20.2
May	40.2	47.5	20.9	17.9
June	37.2	46.3	30.6	14.7
July	35.2	28.4	42.4	13.0
Aug.	40.7	24.5	42.8	12.0
Sept.	42.5	21.5	36.4	14.0
Oct.	45.8	22.1	31.8	14.7
Nov.	49.5	22.8	26.2	14.7
Dec.	49.0	23.7	27.9	12.5

[1]Based on capacity of 50,845,741 gross tons, Dec. 31, 1934; [2]capacity of 50,975,561 tons, Dec. 31, 1933; [3]capacity of 50,313,975 tons, Dec. 31, 1932; [4]capacity of 51,598,175 tons, Dec. 31, 1931. Capacities by American Iron and Steel Institute.

To Install Slabbing Mill at Inland; Other Mesta Orders

Inland Steel Co., Indiana Harbor, Ind. has authorized the construction of a 46-inch reversing slabbing mill complete with auxiliary equipment to supplement its continuous 76-inch hot broad strip mill. The new unit, which will be built by the Mesta Machine Co., Pittsburgh, will free the bloomer of the finishing slabbing passes and thus increase production of semifinished material.

Mesta Machine Co. also is building the following equipment for 1936 delivery:—A 5-stand tandem, 20 & 53 x 42-inch cold mill for the American Sheet & Tin Plate Co., Gary, Ind.; additional cold rolling equipment for the Youngstown Sheet & Tube Co., Campbell, O.; a 5-stand tandem cold mill for tin plate production for the Bethlehem Steel Co., Sparrows Point, Md.; and a broad hot and cold strip mill for the Great Lakes Steel Corp., Detroit, a subsidiary of the National Steel Corp.

For the new cold rolling extension of the American Sheet & Tin Plate Co., Gary, Ind., E. W. Bliss Co., Brooklyn, N. Y., has on order one 20 & 48 x 84-inch planishing stand and two 20 & 36 x 42-inch planishing stands; and, the Continental Roll & Steel Foundry Co., Chicago, one 20½ & 56 x 60-inch reversing and two 20½ & 56 x 84-inch tandem cold mills.

Potts Now Co-Partnership

Effective Dec. 31, a co-partnership has been formed by Harrison I. Potts, Thomas C. Potts, Horace M. Potts, Guy P. Bible, and Morris E. Neeley, to take over the steel warehouse business formerly conducted by Horace T. Potts Co. (a Pennsylvania corporation), of Philadelphia.

Bars

Bar Prices, Page 288

Pittsburgh—The Pittsburgh base on merchant bars at 1.85c for 5 to 25-ton lots is firmly observed and a fair volume of buying continues. In alloy bars commitments of automobile makers is still outstanding, the base price on the latter grade holding at 2.45c.

American Car & Foundry Co., New York, bid $442 an 55 days' delivery for 80 steel tie bars to be used in repairing lock gates on the Ohio river when bids were opened Dec. 30 by the federal engineers at Pittsburgh.

Cleveland—Steel bar specifications in December were equal to those of November, with most of the tonnage from automobile forge shops, agricultural implement manufacturers and machine tool builders. Some machine tool plants are booked into March. The holidays and inventories have tended to reduce recent releases, but specifications are in hand for a substantial increase in shipments.

Chicago—Farm implement manufacturers are preparing estimates of first quarter requirements and production the coming three months will show a substantial increase over the 1935 period. Specifications elsewhere have recovered moderately and active demand is in prospect for early 1936.

New York—Commercial steel bar sellers generally look for an improvement in specifications shortly, as consumers' stocks are low. Most buyers have signed contracts for the quarter, as protection against possible mid-quarter advances.

Philadelphia — Sellers of commercial steel bars expect a moderately active month in January as consumers' stocks generally are low. Possibility of a price advance later in the quarter is still a matter of discussion by the trade.

Cold Finished

Cold Finished Prices, Page 289

Pittsburgh — Automotive partsmakers, with late January and early February assembly schedules at hand, are frequent buyers of cold-finished bars. Jobbers, having completed year-end inventories, may re-enter the market, which holds steady at 2.10c, base, Pittsburgh.

Bolts, Nuts, Rivets

Bolt, Nut, Rivet Prices, Page 289

Orders for bolts and nuts have improved at Cleveland, including three carloads of track spikes, about 75 tons, for Baltimore & Ohio. Specifications from automobile manufacturers are heavier, and it now appears that January shipments to these users will show a substantial gain over January last year.

Plates

Plate Prices, Page 288

Pittsburgh—American Bridge Co., Pittsburgh, will fabricate about 700 tons of plates for repairs to 20 Carnegie-Illinois Steel Corp. coal barges, the first of which is in the Ambridge, Pa., repair yards. H. H. Halliday Sand Co., Cairo, Ill., has placed a contract with American Bridge Co., Pittsburgh, for construction of a steel hull derrick boat, 90 x 30 x 5 feet, complete with a cabin, 28 x 42 x 10½ feet. Plates remain quoted 1.80c, Pittsburgh.

Cleveland—Plate orders still are restricted to small lots, carloads being infrequent. The material generally is wanted immediately, inventories being low. Some fabricators, notably tank and boiler manufacturers, report more business in prospect. Railroads have covered for first quarter, and their specifications are expected to increase in January.

New York—Distribution of plates for the Pennsylvania car program and for the proposed liner of the International Mercantile Marine-Roosevelt Steamship Co., to be constructed by the Newport News Shipbuilding & Dry Dock Co., Newport News, Va., is expected soon. Also pending is some good oil company tonnage, several thousand tons still to be placed for various projects, particularly in the southwest.

United Dry Docks Inc., New York, is inquiring for 3000 tons of plates for three New York municipal ferryboats and several barges.

Philadelphia—Approximately 20,000 tons of hull steel is required for four tankers for the Pan American Oil & Transportation Co. Two, it is reported, will be built by Federal Shipbuilding & Dry Dock Co., Kearny, N. J. and two by Sun Shipbuilding & Dry Dock, Chester, Pa.

Contracts Placed

700 tons, repairs to 20 Carnegie-Illinois Steel Corp. coal barges, to American Bridge Co., Pittsburgh.

Contracts Pending

200 tons, 4255 feet of spiral pipe, Trenton, N. J., to the Shelt Co. Inc., Elmira, N. Y.

185 tons, eight tanks, Gulf Refining Co., for erection at Erie, Pa., to the Hammond Iron Works, Warren, Pa.

150 tons, 300,000-gallon elevated tank, Community Water Service Co., Tiffin, O., to Pittsburgh Des Moines Steel Co., Pittsburgh.

Sheets

Sheet Prices, Page 288

Cleveland—Sheet mills here and in an adjacent lake district are operating at capacity, and have specifications in hand to continue at this rate through January, most of the tonnage being for automobile manufacturers. Heavier shipments are being made by truck to the Detroit district. Refrigerater manufacturers are getting under way with new models and taking more material. While producers have had to meet the lower prices on sheets in the Michigan automobile district, the concession of $3 a ton apparently has been restricted to that area, and mills generally are refusing to contract for the first quarter at the lower figures.

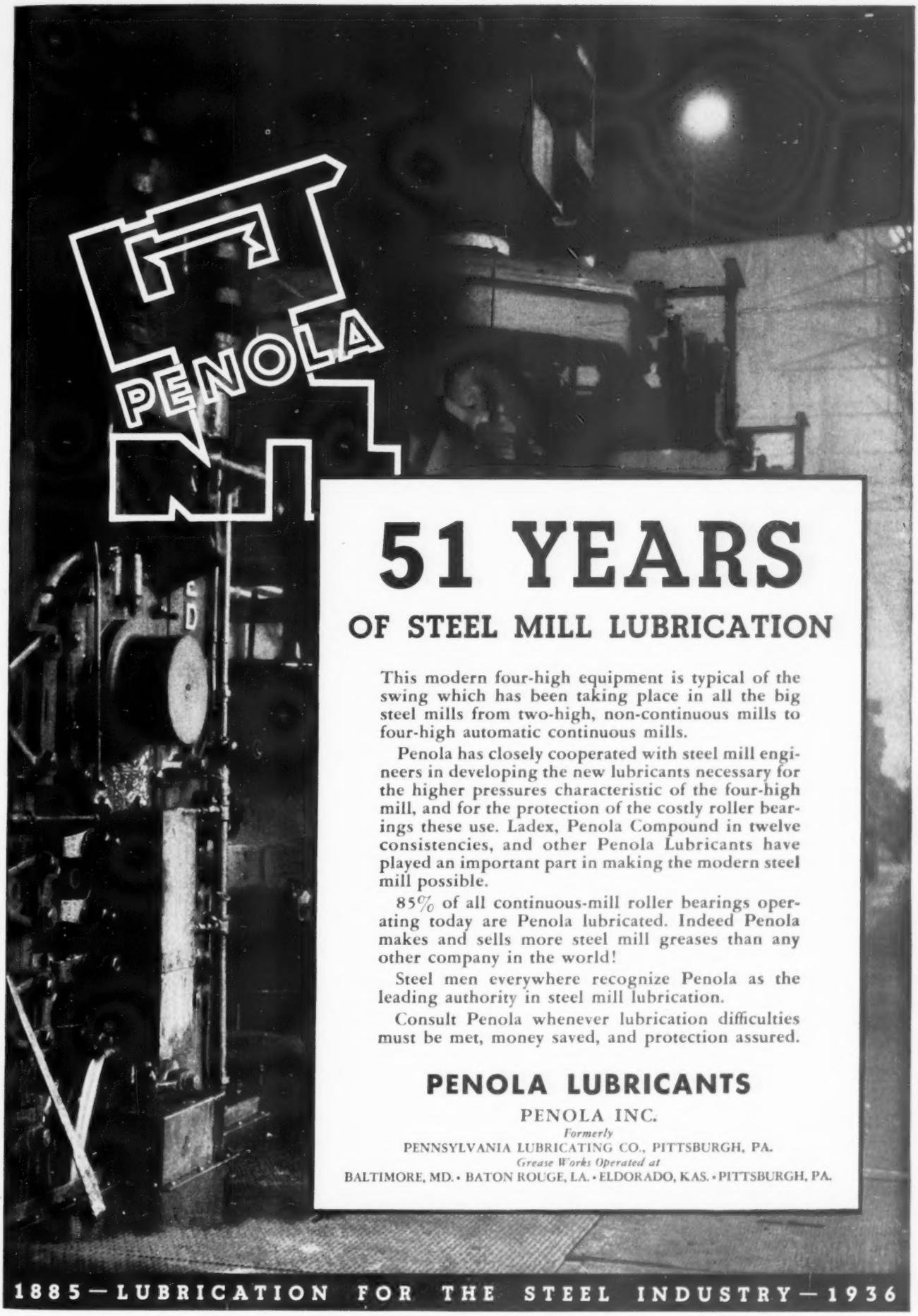
Pittsburgh—Sheet mills last week began to recoup quickly from the shutdown over Christmas and the average of producers' operations was at about 75 per cent, compared with 50-55 per cent the week preceding. A leading interest operated its sheet mills through last week at 80 per cent. Heavier automotive sheet buying appears to be displacing the former prominence of the miscellaneous-type order. Sheet base prices are continued unchanged, with 2.40c, Pittsburgh, quoted on black, 2.50c on No. 10 gage cold rolled, and 2.95c on No. 20 gage cold rolled.

Chicago — Sheet business has shown some recovery among miscellaneous consumers, while automotive shipments generally remain heavy. An increase in consumption by the farm implement industry is in prospect for first quarter.

Birmingham, Ala. — Sheet mills are operating steadily and indications point to an active production for some time. Prospects for the new year are bright.

New York—While current specifications are spotty, reflecting the holiday and inventory season, sellers are starting off the new year with rolling schedules extended. On most grades of hot rolled sheets, deliveries are three to four weeks, although some mills are able to do a little better; and on cold finished sheets, four to five weeks and beyond. Sellers look for an early improvement in specifications.

Cincinnati—Sheet mill production, tempered because of the holidays,



51 YEARS

OF STEEL MILL LUBRICATION

This modern four-high equipment is typical of the swing which has been taking place in all the big steel mills from two-high, non-continuous mills to four-high automatic continuous mills.

Penola has closely cooperated with steel mill engineers in developing the new lubricants necessary for the higher pressures characteristic of the four-high mill, and for the protection of the costly roller bearings these use. Ladex, Penola Compound in twelve consistencies, and other Penola Lubricants have played an important part in making the modern steel mill possible.

85% of all continuous-mill roller bearings operating today are Penola lubricated. Indeed Penola makes and sells more steel mill greases than any other company in the world!

Steel men everywhere recognize Penola as the leading authority in steel mill lubrication.

Consult Penola whenever lubrication difficulties must be met, money saved, and protection assured.

PENOLA LUBRICANTS

PENOLA INC.

Formerly

PENNSYLVANIA LUBRICATING CO., PITTSBURGH, PA.

Grease Works Operated at

BALTIMORE, MD. • BATON ROUGE, LA. • ELDORADO, KAS. • PITTSBURGH, PA.

1885—LUBRICATION FOR THE STEEL INDUSTRY—1936

was further curtailed, by the leading interest here to make strip mill adjustments. First quarter bookings are heavy, some induced by widespread talk of a price rise.

Boston—With consumers' stocks low, sheet sellers expect an early improvement in specifications to follow the completion of inventory. Deliveries range up to four weeks on certain hot finished products, and up to five weeks and beyond on cold finished sheets.

Philadelphia—Reports of an impending price advance on sheets and strip persist, but nothing definite has developed. Specifications are expected to expand after inventory.

Strip Steel

Strip Prices, Page 289

Cleveland—Shipments of hot and cold-rolled strip have increased to their pre-holiday volume, on strong demand from automobile manufacturers, partsmakers and miscellaneous consumers. The Cleveland mill is operating close to capacity. Producers generally have specifications for heavy shipments this month, and the majority of large users have covered their requirements for first quarter.

Pittsburgh—Quotations on strip steel continue unchanged at 1.85c, Pittsburgh, for hot-rolled and 2.60c, Pittsburgh or Cleveland, on cold-rolled. The New Year holiday was generally observed and operations continued at 55-60 per cent. An optimistic automotive outlook is having its effect in strip steel specifications.

New York—While the strip trade is marking time, pending the end of the holiday and inventory period, sellers are looking forward to a good first quarter. The automobile accessory trade is expected to contribute most tonnage, although this business may not be the factor it has been in other years, in view of the buying of the past several weeks for the early season.

Wire

Wire Prices, Page 289

Pittsburgh—According to the stand taken by larger wire producers, the increase of $2 a ton on rods and $3 per base column on fencing is being closely adhered to. Cancellation of quantity differentials on merchant wire products was not withheld until the first of the year and has been in effect for the past three weeks. The market is quoted $2.40 a keg on nails, 2.30c for plain bright wire, and 2.90c on spring wire.

Cleveland — Jobbers have been placing more orders for fencing in anticipation of early 1936 requirements. Demand for manufacturers wire is strong.

Tin Plate

Tin Plate Prices, Page 288

Pittsburgh—After the Christmas week holiday observance in most hot tin mills, operations last week increased to about 75 per cent. This rate compares with 40 per cent two weeks ago and 80 per cent three weeks ago. A leading interest operated through last week at 82 per cent. Canmakers' specifications for general-line cans are encouraging.

Semifinished

Semifinished Prices, Page 289

Advanced prices on semifinished steel now are in effect at $29, base Pittsburgh, for rerolling billets, $30 for sheet bars, $40 for common wire rods, and $42 for combination rods. Semifinished steel shipments will be heavier in January than in December.

Pipe

Pipe Prices, Page 289

Cleveland—Numerous orders are being placed by Ohio municipalities for cast pipe, with federal financing. Demand from such sources is better than in some months, and is expected to increase as weather conditions improve. Miscellaneous sales of steel pipe are relatively light.

Pittsburgh—Little feature exists in the market for tubular products although buying is at a steady rate and sufficient to engage producers here at an estimated 50 per cent.

Birmingham, Ala.—Pipe shops are well supplied with business for the start of the year. A week's layoff permitted necessary repairs, and active production is in prospect for several weeks.

Seattle—Inquiry continues active, as many cities are planning extensions and replacements. Several sizable awards are pending. Bids have been opened at Whitney, Idaho, by the Whitney-Nashville Waterworks Co. for replacement of 12,000 feet of 3-inch cast pipe. Heppner, Oreg., plans to replace $1\frac{3}{4}$ mile of wood pipe with steel, $12,700 being available.

Cast Pipe Placed

200 tons, water line, Bloomdale, O., to James B. Clow & Sons, Chicago.
200 tons, water line, Danville, O., to James B. Clow & Sons, Chicago.
150 tons, water line, Columbus, O., to James B. Clow & Sons, Chicago.

Cast Pipe Pending

115 tons, 6 to 18-inch, classes B and D., for Tacoma, Wash.; bids in.

Transportation

Track Material Prices, Page 289

While freight carbuilders are preparing bids on relatively few lists they see signs of improvement in 1936. It is believed car orders may total 35,000 to 40,000 this year, against slightly under 20,000 as now estimated for 1935, and 23,829 for 1934. Locomotive buying was light in 1935, but the Pennsylvania is reliably understood to have purchase of 100 under consideration.

The Santa Fe has distributed contracts for 58,000 tons of steel rails. The larger part is believed to have been awarded the Colorado Fuel & Iron Co., with Carnegie-Illinois Steel Corp., Inland Steel Co. and Bethlehem Steel Co. taking part. A year ago this road placed 25,883 tons.

Rail Orders Placed

Atchison, Topeka & Santa Fe, 58,000 tons, divided among various producers.

Car Orders Pending

Aluminum Co. of America, Pittsburgh, twenty-two 70-ton covered hoppers, for Aluminum Ore Co.; bids asked.

Buses Booked

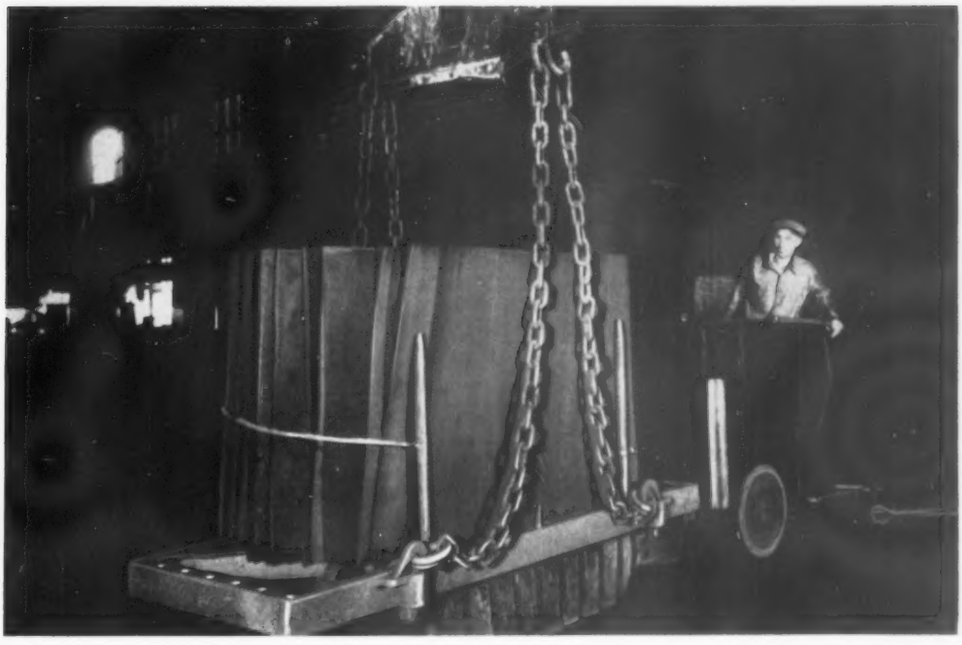
White Motor Co., Cleveland: Eighteen chassis for American Bus Lines Inc., Los Angeles; five 36-passenger intercity coaches for Manhattan Transit Co., Newark, N. J.; three 23-passenger city coaches for Suburban Bus Lines, Hackensack, N. J.; four 23-passenger city coaches for Illinois Power & Light Co., St. Louis; three chassis for Chicago Railways Co., Chicago.

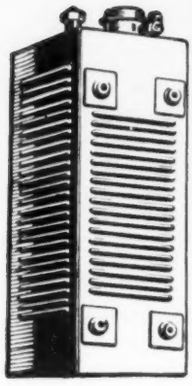
Sharpe Mfg. Co., manufacturer of air compressors, paint spraying equipment and supplies, has moved its factory and offices into new and larger quarters at 1224 Wall street, Los Angeles, effective Jan. 2. The company has just completed installation of newly-perfected machinery, which will double the plant's present capacity.

Costly

DELAYS AVOIDED!

low cost – a result of steel construction





THE EDISON is the only Storage Battery of American manufacture which is built of steel. Its electrolyte is alkaline, a steel preservative. All other storage batteries are lead-and-acid.

WHENEVER you consider the cost of an industrial storage battery it is well also to consider the devastating cost of delays – whether it be men, machinery, materials or all three! Storage battery failure in an industrial truck can cost many times the value of the battery itself.

It is a recognized fact that Edison Batteries are not subject to sudden failure. No one ever challenges the greater dependability of the battery that is built of steel – and which employs an alkaline preservative of steel as electrolyte. An Edison keeps things moving.

And, as to its own cost, 2 to 5 times longer life and less maintenance combine to make it the most economical of batteries. Men who know steel know this... but are you sure about your own company's batteries?

Illustration shows use of Edison-powered truck in Allegheny's mills at Brackenridge.

EDISON STORAGE BATTERY

DIVISION OF THOMAS A. EDISON, INC., WEST ORANGE, NEW JERSEY

Shapes

Structural Shape Prices, Page 288

Pittsburgh—Inquiry has been issued for the long discussed Jerome street bridge, McKeesport, Pa., which is under WPA sponsorship. The inquiry involves 1500 tons of structural material. Keystone Engineering Works, Pittsburgh, has taken 630 tons for two trade schools at Pittsburgh. An inquiry for two hangars at the Allegheny county airport involves 700 tons.

Chicago—Awards include 1200 tons for bridges in Colorado and Kansas. Also 500 tons piling have been placed for a dock for the Standard Oil Co. of Indiana.

Cleveland—The market is quiet, public works projects being slow to develop into steel awards, and few private projects pending at present. Although general contracts have been placed for nine public school buildings in Cleveland, steel probably will not be ordered until the middle of January. Ingalls Iron Works Co., Verona, Pa., shared to the extent of about 135 tons in recent awards for Toledo, O., public schools.

Los Angeles—Consolidated Steel Corp., Los Angeles, has booked approximately 4200 tons of structural shapes for General Motors Corp.'s assembly plant to be built here.

New York—Contracts for fabricated structural steel in November were slightly in excess of the average monthly tonnage contracted for during the first 11 months of 1935, according to the American Institute of Steel Construction. On the other hand, the total tonnage produced and the total tonnage shipped during November recorded a slight decline from the monthly average, a seasonal development. The industry operated at 33.4 per cent during November, and the average monthly rate for the 11 months was 37.5 per cent.

Philadelphia—Fabricators expect improved business in January. Many public works projects on which bids have already been taken will be awarded.

TITAN
DOUBLY DEOXIDIZED
Bronze Welding Alloys

All Titan welding rods are *doubly-deoxidized*. This means, that all occluded and dissolved gases picked up in the melting are removed, preventing the poor flow that results in porous welds. Absorption of gases from the torch, from the atmosphere, and from the job itself, is also prevented.

Titan Bronze Welding Alloys tin easily and uniformly. They are corrosion resistant, low melting and low fuming—the latter resulting in a more comfortable atmosphere for the welder. Double-deoxidizing produces *ductile welds—high strength welds—dense non-porous welds.*

Ask us for detailed information.

Titan Metal Manufacturing Company
Brass and Bronze Products
Bellefonte, Pennsylvania

Shape Contracts Placed

4200 tons, assembly plant, Los Angeles, for General Motors Corp., to Consolidated Steel Corp., Los Angeles.

2150 tons, Archives building, Washington, formal contract to Fort Pitt Bridge Works, Pittsburgh, Pa.

1110 tons, state highway bridge RC-3697, Broome county, New York, to American Bridge Co., Pittsburgh.

630 tons, Washington trade school, Pittsburgh, 425 tons, and Burgwin trade school, Pittsburgh, 205 tons, to Keystone Engineering Co., Pittsburgh.

550 tons, brewery building, Detroit, for Koppitz & Melcher Co., to Whitehead & Kales Co., Detroit.

500 tons, piling, dock, Standard Oil Co. of Indiana, East Chicago, Ind., to Carnegie-Illinois Steel Corp., Pittsburgh; Fitzsimons & Connell Dredge & Dock Co., Chicago, general contractor.

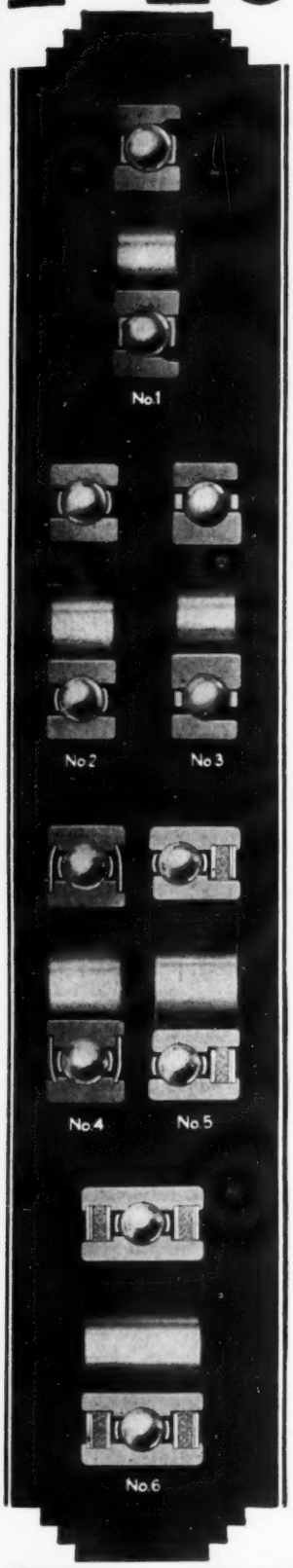
500 tons, state bridge, Albany, Calif., to Moore Dry Dock Co., San Francisco.

425 tons, bridge, Crowley county,

Shape Awards Compared

	Tons
Week ended Jan. 4	20,075
Week ended Dec. 28	17,295
Week ended Dec. 21	25,584
This week, 1935	25,323
Weekly average, 1935	17,081
Weekly average, 1936	20,075
Weekly average, December	23,300
Total to date, 1935	25,323
Total to date, 1936	20,075

PRECISION



FOR PRODUCTION AT LOWER COST

This is the objective of every executive, engineer and designer; and the performance of the bearings in a production machine is a vital factor in keeping costs down. * * * * But, in comparing bearings, look beyond first cost—look to the ultimate cost over a period of years. Let proved performance point the way to your decision. * * * * For 20-odd years, in every field of industry, **Norma-Hoffmann Precision** Bearings have been making distinguished records for unfailing dependability—records which command the confidence of those who seek the lower production costs that come with the use of better bearings.

PRECISION BEARINGS
FOR EVERY LOAD, SPEED AND DUTY

No one type of bearing is so versatile in its operating characteristics that it will meet all conditions; conditions should determine the type of bearing used. From the comprehensive **Norma-Hoffmann** line—here illustrated in part and briefly indexed—a **Precision** Bearing, or several in combination, can be chosen that will be exactly right for the duty. Let our engineers, with their specialized experience, work with you in selecting and applying bearings that will lower your production costs. Write for the Catalog.

1—Open (Separable) type ball bearing.

2—Closed, radial type ball bearing.

3—Angular contact ball bearing.

4—Plate (shielded) type ball bearing; available both with one and two grease-retaining, dirt-excluding side plates.

5—"GreaSeal" felt-protected ball bearing with single removable felt seal; available also with single removable felt seal and plate shield, fully enclosed.

6—"GreaSeal" double felt-protected ball bearing, fully enclosed, with double removable felt seal to exclude dirt and retain lubricant.

7—Double-row, self-aligning ball bearing; also furnished with adapter sleeve and nut.

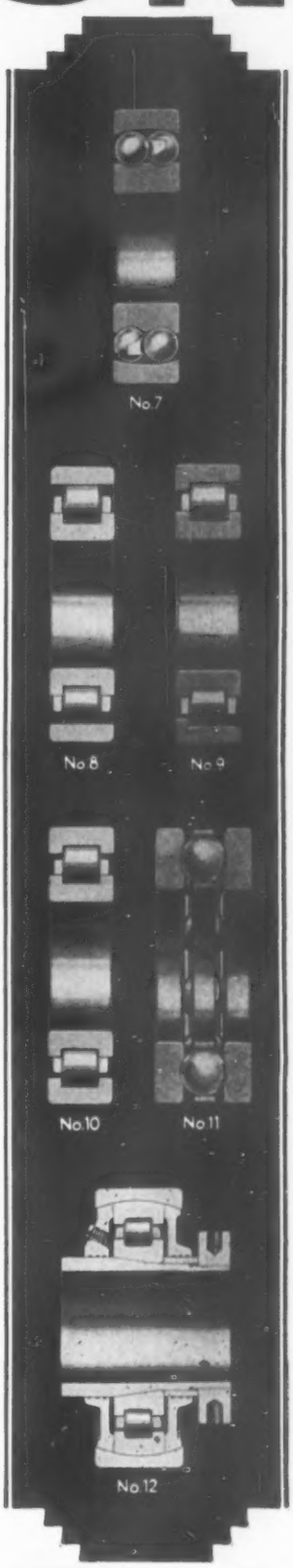
8—Standard cylindrical roller bearing.

9—One-lipped cylindrical roller bearing.

10—Two-lipped cylindrical roller bearing; available also in "full" (cageless) type with retaining rings.

11—Ball thrust bearing.

12—Self-aligning adapter type cylindrical roller bearing, wholly enclosed to exclude dirt and retain lubricant.



NORMA-HOFFMANN BEARINGS CORPORATION

Stamford, Conn., U. S. A.

"NORMA-HOFFMANN"

BEARINGS

Kansas, to Kansas City Structural Steel Co., Kansas City, Mo.

400 tons, bridge, Wakefield, Kans., to St. Joseph Structural Steel Co., St. Joseph, Mo.

395 tons, Tennessee valley administration, Knoxville, Tenn., with 185 tons at Corinth, Miss., going to the Laclede Steel Co., St. Louis, and the remainder for shipment to another point, to the Carolina Iron & Steel Co., Greensboro, N. C.

375 tons, bridge, Colorado Springs, Colo. to Minneapolis-Moline Power Implement Co., Minneapolis.

365 tons, state highway bridge, Catskill, N. Y., to McClintic-Marshall Corp., Bethlehem, Pa.

305 tons, viaduct WPGH-352-A, Coffey county, Kansas, to the Pittsburgh-Des Moines Steel Co., Pittsburgh.

300 tons, bridge, Grandville, Mich., to R. C. Mahon Co., Detroit.

300 tons, piling, dam for Spokane water system, to Pacific Coast Steel Corp., Seattle.

275 tons, St. Joseph's home, Meadowbrook, Pa., to Morris Wheeler & Co., Philadelphia.

275 tons, postoffice, Waco, Tex., to Austin Bros., Dallas, Tex.

260 tons, city hospital, Oneida, N. Y., to the Smith & Caffrey Co., Syracuse, N. Y.

225 tons, state highway bridge, NRM HHP-35-2, Bronx county, New York, to Jones & Laughlin Steel Corp., Pittsburgh.

220 tons, bridges for Southern Pacific, Houston, Tex., to Jones & Laughlin Steel Corp., Pittsburgh.

200 tons, postoffice garage, Rochester, N. Y., to F. L. Heughes & Co. Inc., that city.

195 tons, health center, Astoria, Long Island City, N. Y., to Bethlehem Fabricators Inc., Bethlehem, Pa.

185 tons, intermediate school, Roxbury, Mass., to Groisser & Shlager Iron Works, Somerville, Mass.

180 tons, bridge, 8177, Pope county, Arkansas, to the Vincennes Bridge Co., Vincennes, Ind.

175 tons, high school, Hudson, N. Y., to Belmont Iron Works, Philadelphia.

170 tons, courthouse addition, Salisbury, Md., to Dietrich Bros., Baltimore.

170 tons, high school, Marblehead, Mass., to New England Structural Co., Everett, Mass.

160 tons, state highway bridge, RC-3692, Erie county, New York, to the R. S. McMannus Steel Construction Co. Inc., Buffalo.

150 tons, bridge, Hampton, N. H., to Boston Bridge Works Inc., Cambridge, Mass.

145 tons, additional material for Lehr building, Alton, Ill., to Rogers Structural Steel Co., Cory, Pa.

125 tons, state highway bridge, ER RC-3677, Cortland county, New York, to American Bridge Co., Pittsburgh.

120 tons, Practical Arts school building, Laconia, N. H., to Lyons Iron Works Inc., Manchester, N. H.

115 tons, high school addition, Ithaca, N. Y., to Smith & Caffrey Co., Syracuse, N. Y.

100 tons, state highway department buildings, Vancouver and Wenatchee, Wash., to Isaacson Iron Works, Seattle.

Shape Contracts Pending

1500 tons, Jerome street bridge, McKeesport, Pa.

1100 tons, rayon plant, Amphill, Va., for E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.

700 tons, Ward's Island sewage plant, New York.

700 tons, two hangars, for Allegheny county airport, Pennsylvania.

660 tons, grade crossing eliminations, various locations, New York.

600 tons, building, Douglas Aircraft Co., Santa Monica, Calif.

550 tons, Kress store, Atlanta, Ga.

300 tons, Rock Island railroad bridge, Chicago.

294 tons, Plymouth township, Montgomery county, Pennsylvania state bridge; bids Jan. 17. Project also includes 77 tons of bars.

60 tons, span, King county, Washington; bids Jan. 14.

Unstated, five state bridges in Montana; general contracts awarded.

Geometric Tool Co., New Haven, Conn., manufacturer of machinery and tools for cutting screw threads, has appointed Jeffrey-Gilles Inc., Caxton building, Cleveland, its exclusive agent for Cleveland and vicinity. P. A. Pritchard, who for many years has been the direct sales and service engineer for the company in the Cleveland territory, will make his headquarters with the newly-appointed agency.

The Brosius Patented Two Motor Electric Mechanical Clay Gun shown below is the latest type of equipment for stopping the tapping hole of blast furnaces. A distinctive feature of the gun is the elimination of the clamping mechanism. There is no clamping interval and the hole is stopped the instant the gun is swung in. The hole is stopped against full wind pressure at every cast, many stops being made against iron and slag. Constant gas pressure is maintained and uniform moving and melting of the stock gives increased iron production and much lower dust loss. It is economical in the use of clay and the use of pricker rods and raveling rods is reduced to a minimum.

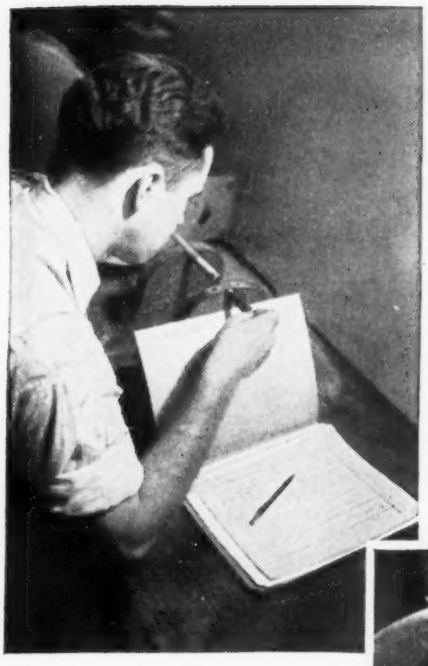
EDGAR E. BROSIUS, Inc.

Sharpsburg Branch

PITTSBURGH, PA.

Products: Steam, Hydro-Electric, and Electric-Mechanical Clay Guns, Motor Driven Goggle Valves, Hot Blast Valves, Stock Line Indicators, Motor Driven Cinder Notch Stoppers, Flue Dust Conditioners, Blast Furnace Slag Granulating Machines, Coke Testing Tumbling Barrels, Automatic Dump Buckets, Single Hook Grab Buckets, Automatic Single Hoist Grab Buckets, Charging Machines for serving Heating and Melting Furnaces, Auto Floor Manipulators for serving Steam Hammers, Presses, etc.

Guardians of the B.t.u.



(*Above*) A split hair at furnace heat! Measuring with a micrometer gauge the thermal changes of a high-temperature insulation material. Furnace at left containing test specimen is accurately controlled. Expansion or contraction at high temperatures must be fully understood before recommendations for specific installations are given.

Johns-Manville
INDUSTRIAL INSULATIONS
For every temperature condition from 400° F. below zero to 3000° F. above.

JM

(*Right*) Switchboard that controls the power supplied to the heaters in conductivity testing units at the J-M Insulation Laboratories. Power input to any heater may be measured to within ½ of 1 per cent.

(*Left*) Measuring and evaluating dried test specimens of insulating cements at the J-M Insulation Laboratories. The same weight of material was employed for both specimens. Note high shrinkage of the one in the foreground.

IN THESE photographs, in these brief captions, we can give you no more than a few hasty glimpses into our Thermal Insulation Laboratories, at Manville, N. J., largest in the world.

But we hope that you will come right into the laboratories with us, through the medium of our new brochure, entitled "Guardians of the B.t.u."

Here, in highly realistic photographs and interesting text, there is unfolded the fascinating story of many men who are devoting their lives to the study of one subject . . . the *control of heat*.

Their equipment, their experiments, their tests, cannot fail to be of interest to any technical man.

And, if your interest in the subject is a more practical one, if you are concerned with the more efficient, more economical operation of any type of heated or refrigerated equipment, you literally cannot afford to ignore the importance of heat-control research as it is carried on daily at Manville . . . research which has resulted in savings to industry totaling hundreds of millions of dollars annually.

We give you two specific examples selected from the large group of Johns-Manville's heat-saving, money-saving industrial insulations . . .

J-M Superex Blocks

For many years, in many thousands of installations, Superex has proved itself the superior block insulation for high-temperature industrial equipment.

Superex is especially well adapted for the insulation of slab-heating, annealing and all types of controlled-atmosphere furnaces, producer gas mains, hot-blast stoves, open hearths and regenerators, and boiler furnaces.

Sil-O-Cel C-22 Brick

Sil-O-Cel C-22 Brick, when used as an insulating refractory at temperatures up to 2000° F., makes possible thinner furnace walls . . . improved operating efficiency . . . lower operating costs. Furthermore, because of C-22's low heat absorption, furnaces can be brought up to heat in an amazingly short time.

May we mail you our brochure, "Guardians of the B.t.u.," the fascinating story of research in the Johns-Manville Thermal Insulation Laboratory? May we send you literature on Superex Blocks and C-22 Brick? Write Johns-Manville, 22 E. 40th Street, New York City.

Reinforcing

Reinforcing Bar Prices, Page 289

Pittsburgh—Distributors of reinforcing steel bars are continuing to center interest on Pennsylvania state highway lettings. A sizable letting is now scheduled for Jan. 10, which lists four separate bar requirements in as many counties, in addition to material requirements for paving work. The 2.05c market is unchanged as quoted for the Pittsburgh base, on carload lots of new billet bars.

Chicago—The largest of recent concrete bar awards is 718 tons for the outer drive link here, placed with Inland Steel Co., Chicago. Shipments against old orders remain fairly heavy while a substantial tonnage for various public projects remains to be placed.

Cleveland—Several hundred tons of reinforcing bars are required for nine Cleveland public schools, the general contracts for which have been awarded. Little work has yet developed from the state highway program for 1936.

New York—Few outstanding reinforcing bar sales are noted here, although with a fairly good number of projects figured, an improvement in orders should develop in the near future. Most pending projects are government financed work. Prices are unsettled.

Philadelphia—Reinforcing bar tonnage is expected to improve as January gets under way, a number of substantial projects pending. Awards during the holiday weeks have been negligible.

Boston—The reinforcing bar market is more promising, with several public projects active.

Seattle — Awards consisted of 100 tons lots or less, many school projects involving from 20 to 50 tons each. Several sizable projects have been readvertised as figures exceeded funds available.

Reinforcing Steel Awards

718 tons, outer drive link, Chicago, to Inland Steel Co., Chicago; Great Lakes Dredge & Dock Co., Chicago, general contractor.

815 tons, dam, Bull Lake, Wyo., to J. S. Groves & Sons, Minneapolis.

337 tons including 78 tons structurals, Arrowrock dam addition, Boise, Idaho, to T. E. Connally, San Francisco.

270 tons, high school, Butte, Mont., to Pacific Coast Steel Corp., Seattle.

200 tons, sewage development, Hagerstown, Md. to Taylor, Davis Inc., Philadelphia.

100 tons, including 30 tons of plates, three tunnels, Shoshone canyon conduit, Wyoming, to Utah Construction Co., Salt Lake City, Utah.

Reinforcing Steel Pending

130 tons, three state overpasses, Washington; bids Jan. 14.

Unstated, eight state grade crossings, Oregon; bids at Portland, Jan. 9 and 10.

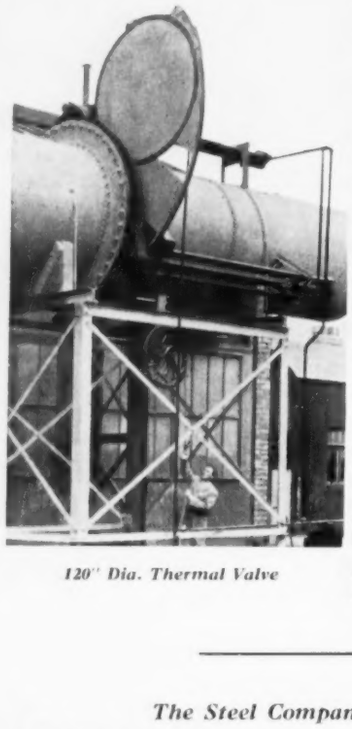
Budd Given Die Order

International Harvester Co., Chicago, has placed an order for dies and steel stampings with the Edward G. Budd Mfg. Co., Philadelphia, for production on 1936 models.

Concrete Awards Compared

	Tons
Week ended Jan. 4	2,440
Week ended Dec. 28	3,965
Week ended Dec. 21	19,803
This week, 1935	938
Weekly average, 1935	6,862
Weekly average, 1936	2,440
Weekly average, December	8,282
Total to date, 1935	938
Total to date, 1936	2,440

THE
BAILEY COMPANY PRODUCTS



120" Dia. Thermal Valve

The Thermal Expansion Gas Valve
The American Open Joint Checker (For Blast Furnace Hot Blast Stoves)
The American Steel Bottom (For Blast Furnace Hot Blast Stoves)
The Automatic Temperature Control (For Blast Furnace Stoves)
"Superior" Open Hearth Checker
American Gas Valve
American Cold Blast Valve
American Chimney Valve
American Mixer & Check Relief Valve
Blast Furnace Mixer & Drop Valve
Vreeland Method and Pug Mill Equipment (For Mixing Hot Blast Furnace Flue Dust at Dust Catcher)
American Sintering Plant Pug Mill
American Safety Cinder Notch Stopper
American Water Metering Method
American Pig Releaser
American Ladle Skulling Hook
American Gas Seal for Gauge Rods

The Steel Companies Using Our Products

Alan Wood Steel Company
Bethlehem Steel Company
Carnegie-Illinois Steel Corp.
Ford Motor Company
Great Lakes Steel Corporation
Gulf States Steel Company
Hamilton Coke & Iron Company
Hanna Furnace Corporation
Inland Steel Company
Interlake Iron Corporation
Jones & Laughlin Steel Corp.
National Tube Company
Pittsburgh Crucible Steel Company
Pittsburgh Steel Company
Republic Steel Corporation
Weirton Steel Company
Wheeling Steel Corporation
Wickwire Spencer Steel Company
Youngstown Sheet & Tube Company
Amtorg Trading Corporation, U.S.S.R.
Ford Motor Company, Ltd., Dagenham, Essex, England
South African Iron & Steel Industrial Corporation, Ltd., South Africa
Stewarts & Lloyds, Ltd., England
Tata Iron & Steel Company, Ltd., India

WILLIAM M. BAILEY COMPANY
MAGEE BUILDING *ENGINEERS* PITTSBURGH, PA.

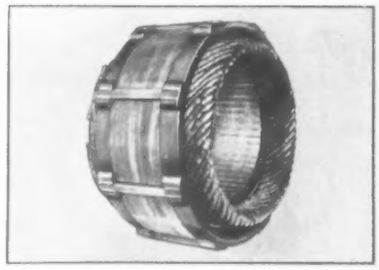
MEET THREE "TOUGH GUYS"

Three F-M motors power the spindle heads on this Sundstrand Rigidmil. It's a machine for a tough job, and Sundstrand demanded motors that were in keeping with the ability of their product to "take it."

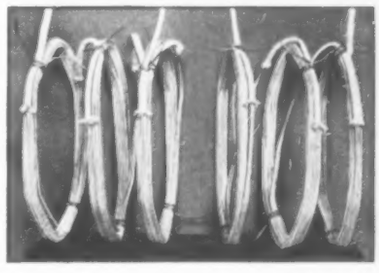
So they chose Fairbanks-Morse Motors!

HERE'S WHY.

LOCKED AND WELDED STATOR CORE—with laminations perfectly japanned and locked and welded under compression between sturdy stator heads. The only bolts and nuts used in the motor are those necessary to hold the bearings to the frame.



GROUP WOUND COILS—An entire phase group from a single piece of wire reduces lead connections—and these are WELDED, not soldered. This construction reduces the individual parts making up the prewound stator just as in the case of stator core.



No matter what your motor requirements may be, it *pays* to see what extra advantages Fairbanks-Morse Motors have to offer. For information, address Department D491, Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 34 Fairbanks-Morse branches throughout the United States are at your service.

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- All internal connections welded
- Permanently plastic moisture-, oil- and acid-resisting insulation on all stator windings

6611EA40-96

FAIRBANKS-MORSE Motors

106 YEARS OF PRECISION MANUFACTURING

Pig Iron

Pig Iron Prices, Page 290

Cleveland — Merchant pig iron shipments in December were 50 per cent larger than those in November and heaviest of the year, completing contracts placed before the price was advanced $1 a ton. As many melters now have stocks, a decline is expected in the movement this month, although it is believed consumption will carry on at the December rate, or better, necessitating additional buying shortly. Some substantial orders have been booked for first quarter at the advanced prices. Republic Steel Corp. here blew out one of its four active stacks last week.

Chicago—Sellers have completed shipments of most of the heavy tonnage booked prior to the price increase. December deliveries were the heaviest of the year and about 65 per cent larger than in November. Foundry operations generally are steady. New business is bringing $19.50, furnace, for No. 2 foundry and malleable.

Pittsburgh—With the turn of the year, the local market is nominally advancing $1 a ton, but shipments are proceeding at the former price against specifications which were entered prior to Jan. 1. Nominally, the Pittsburgh furnace base is now $19 a ton on basic grades, $19.50 for foundry grades and $20 on bessemer.

Cincinnati—Some melters failed to specify fully their fourth quarter contracts to enable shipment by Jan. 1. The $1 advance, which has held firmly on spot business since Nov. 1, and for first quarter business, therefore will not apply on this contracted iron for a reasonable period. New demand is quiet and the effect of the carryover will be noticed until late in January.

Birmingham, Ala.—The market has taken a strong position at the turn of the year, announcements having been made that sales and expected new business will warrant steady operation of blast furnaces for at least three months. Twelve furnaces are active. The base price continues $15.50, for No. 2 foundry.

Boston—Consumers took in substantial quantities during the closing weeks of last year, and are not expected to be active in the market for several weeks.

New York—With consumers specifying freely against contracts made prior to the advance of $1 a ton Nov. 1, little new buying is expected for the present. Relatively little tonnage remained unspecified against contracts expiring Dec. 31.

Philadelphia—The market is quiet. Most consumers have substantial stocks on hand.

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for the
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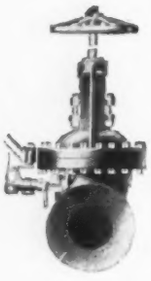
TRIPLE ACTING NON-RETURN VALVES

Afford unfailing protection to life and property in case of boiler failure or steam line rupture by shutting off steam flow in either direction. No boiler plant is safe without these valves.



THROTTLE-ENGINE STOP VALVES

Automatically prevent fly-wheel explosions and assure safe engine or turbine control.

CONTROLLING FLOAT VALVES

Invincible for feed water heaters, tanks, vats, etc. for maintaining a uniform liquid level.

OPEN TANK FLOAT VALVES

Furnished angle and globe types for high or low pressure tank service water level control.

SURGE-RELIEF VALVES

Take disastrous shock out of the lines and prevent bursted mains. Cushioned by air and water for dependable control.

GOLDEN-ANDERSON VALVE SPECIALTY CO.

1340 Fulton Bldg. Pittsburgh, Pa.

Metallurgical Coke

Coke Prices, Page 289

Coke demand is brisk and prices are steady. Connellsville, Pa., producers are quoting $3.50 to $3.75 per ton for standard furnace beehive coke, $4 on common foundry coke, and an unchanged range applies on premium foundry coke at $5.50 to $5.75.

Cincinnati makers' delivery of by-product foundry coke reached the November volume during December, although the last third of the month specifications were lighter.

Both metallurgical and heating coke have been moving actively at Chicago. Foundry coke shipments in December were practically equal to those of November, with a steady rate in prospect for January. The

market continues $9, ovens, for outside delivery and $9.75, delivered Chicago.

Scrap

Scrap Prices, Page 291

Pittsburgh—Early last week a Donora, Pa., consumer distributed orders for 10,000 tons of No. 1 heavy melting steel at $14.50 per ton, delivered. By the unexpected participation in the market by this mill, the Pittsburgh No. 1 steel price advanced 25 cents a ton to $14.25 to $14.75. Railroad lists scheduled for closing this week are at present engaging the scrap trade's interest. The Baltimore & Ohio closes bids Jan. 6 on 1500 tons of melting steel, 1500 tons of rails, 540 tons of structural, 500 tons of cast iron wheels and 195 tons of turnings. The Pennsylvania railroad's list is set for closing Jan. 8.

Chicago—Scrap continues quiet in point of new business from mills, but prices are firm. Shipments against orders reflect the lower rate of open-hearth operations but an increase is in prospect within the next three weeks.

Cleveland—Dealers and consumers marked time as the year ended, with the prospect considerable activity will appear before long. Quotations are strong but have not been tested by actual buying.

New York—Dealers' buying prices are unchanged, but strong, with the movement of domestic scrap expected to be accelerated after inventory. Meanwhile, mills are taking relatively little tonnage, and while there is considerable interest in the export situation, few large tonnages are reported placed.

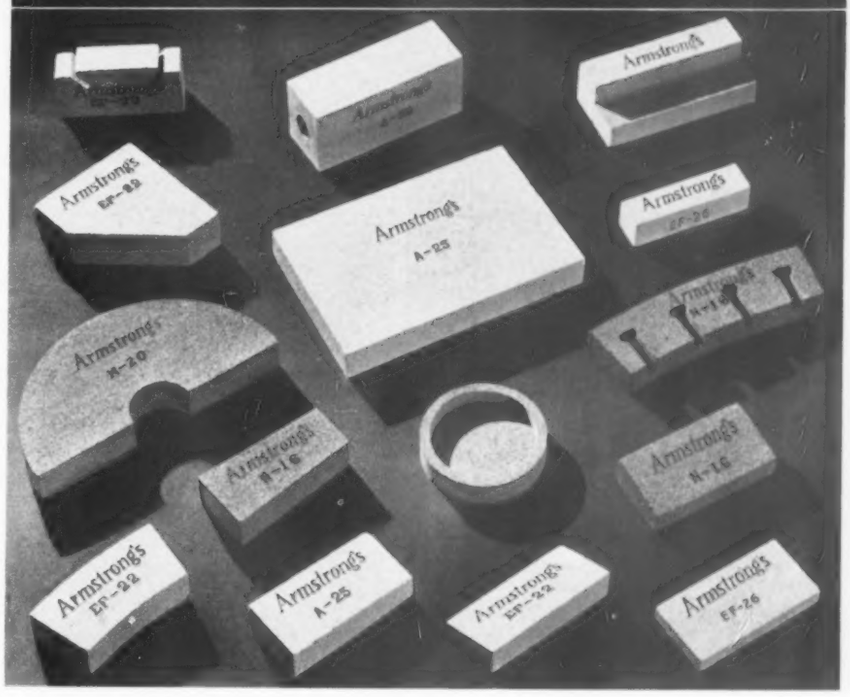
The Greek freighter CHRYSSI has sailed from Jersey City, N. J., with scrap for Genoa, Italy.

Cincinnati—Dullness pervades the iron and steel scrap market. Mills are not inclined to make tonnage commitments. Railroad lists during December were light, bids were unchanged from the preceding month. Supplies are adequate for current shipments and the confident sentiment of middle interests is holding prices firm.

Birmingham, Ala.—Iron and steel scrap is unchanged. While dealers stocks are fair the belief is that there is not a large tonnage available.

Philadelphia—Prices of steel and iron scrap are unchanged but the undertone is strong and supplies are relatively light, indicating a rise in the general price level later in the month.

ALL SPECIAL SHAPES



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YOU can get any special shapes you need, in sizes up to 12″ x 24″ x 4½″, both in Armstrong's Insulating Brick and Armstrong's Insulating Fire Brick.

Armstrong also manufactures and stocks a complete line of standard shape brick, as straights; splits; soaps; wedge, key, and arch bricks. All these bricks are available for a complete range of temperatures and uses.

For use behind the refractory, Armstrong offers N-16 Insulating Brick, highly efficient where the temperature does not exceed 1600° F.; N-20 Insulating Brick—a brick which will not crack, fuse, or spall under temperatures as high as 2000° F.; and A-25 Insulating Brick, for temperatures up to 2500° F.

For direct exposure where flame impingement or slagging action is not encountered, Armstrong makes EF-22, an Insulating Fire Brick efficient up to 2200° F.; and EF-26 Insulating Fire Brick, for temperatures up to 2600° F. Ask for a copy of the new folder of facts "Armstrong's High Temperature Insulation . . ." Armstrong Cork Products Co., Building Materials Division, 985 Concord Street, Lancaster, Pa.

Armstrong's

HIGH TEMPERATURE INSULATION

Increased buying is likely to follow the usual slack season at the turn if the year and contnued heavy consumption indicates need for tonnage.

Adds Open Hearths

Two 150-ton open-hearth furnaces now are being built at the steelmaking department of the Great Lakes Steel Corp., Ecorse, Detroit. When completed the company will have a complement of 10 basic open hearths, each of 150 tons capacity and oil fired.

Iron Ore

Iron Ore Prices, Page 291

New York—Although chrome ore prices generally are unchanged, the market is strong and in 45 per cent Turkish lump ore quotations have been increased to a spread of $16.50 to $17.50, c.i.f., gross ton.

One seller of African manganese ore has advanced his price on 50 to 52 per cent material to a spread of 26c to 27c, per unit, minus duty, Atlantic ports. Chinese tungsten ore is slightly stronger at $15.85 to $16, duty paid, per short ton unit.

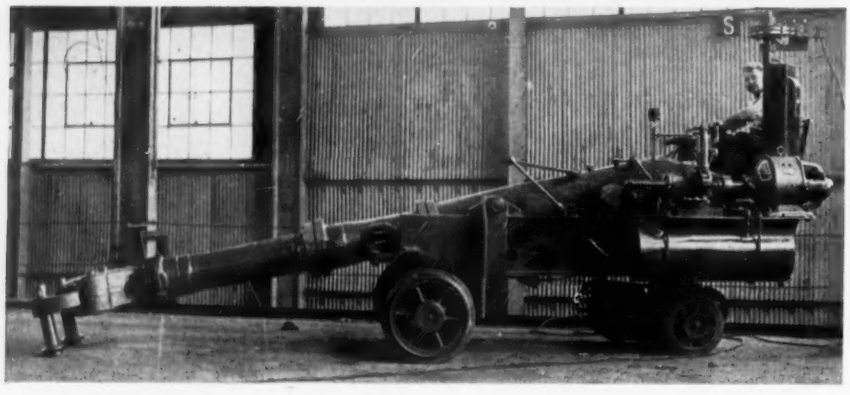
While advances have been made by some domestic producers, imported fluorspar remains unchanged at $20 per net ton, duty paid, for 85.5 per cent material. With the winter season at hand, little fluorspar is being moved in the North.

Cleveland—Of the 28,078,782 tons of iron ore shipped from the Lake Superior district by vessel last year 15,582,211 tons was nonbessemer. Shipments of all grades increased, except silicious. The Lake Superior Iron Ore association reports tonnages as follows:

	1934	1935
Bessemer	5,228,497	6,511,805
Nonbessemer	15,582,211	20,071,373
Manganiferous	695,096	983,927
Silicious	521,251	511,677
TOTAL	22,027,055	28,078,782

Shipments from ranges in 1935 compared with 1934 follow:

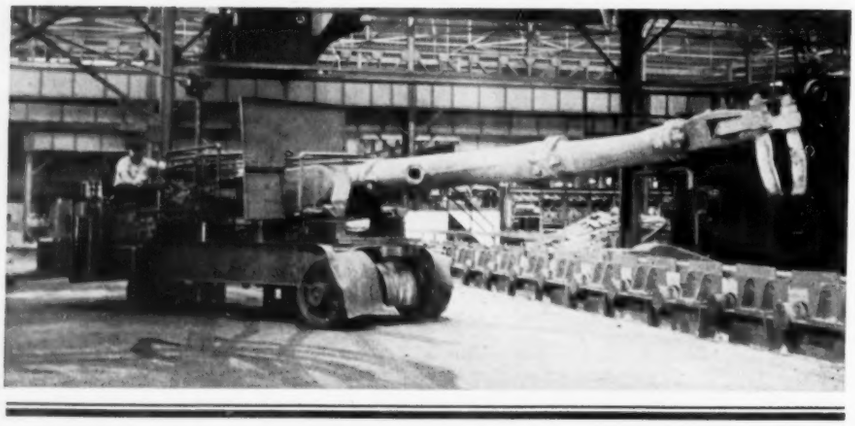
	1934	1935
Mesabi	14,774,667	18,695,407
Marquette	2,396,339	3,111,376
Goebic	2,263,896	3,038,101
Menominee	1,317,445	1,628,029
Vermilion	777,230	842,780
Cuyuna	497,478	763,083
TOTAL	22,027,055	28,078,782



These pictures show Brosius Patented Auto Floor Charging Machines, each machine having a capacity of 10,000 pounds. The one above is handling ingots in and out of a heating furnace and delivering them to steam hammers. The one below is serving double row heating furnaces, handling up to 10,000 pound blooms in and out of the furnaces and to and from the roller table of a roughing mill, also turning the blooms in the furnace.

We build these machines in capacities of from 1 to 5 tons and design them for serving heating furnaces, steam hammers, forging presses, mill tables, etc. We also build them for handling charging boxes for serving open hearths, cupolas, etc.

EDGAR E. BROSIUS Inc.
Sharpsburg Branch
PITTSBURGH, PA.



Warehouse

Warehouse Prices, Page 292

New York—Jobbers report a fairly good improvement in sales for the year. Improvement was noted particularly among the specialty houses. Jobbers made some changes in cold-finished bar schedules Jan. 1, although leaving the base price unchanged.

Cincinnati — Year-end influences are curtailing demand, after a tonnage increase of about 15 per cent above 1934. This gain was achieved without much help from renewed demand in building materials.

Cleveland—Warehouses advanced cold-drawn steel bars $3 a ton Jan. 1, in accordance with the recent change in the mill price. The new quotation here is 3.50c for local delivery. Warehouse business in 1935 was about 25 per cent larger than in 1934, and approximately half the volume of 1929. Buying during the week was restricted by influences usually present during the holidays.

Seattle — Tonnages have been small and varied, but the total for the past two weeks is somewhat greater than a year ago. Prices are steady.

Ferroalloys

Ferroalloy Prices, Page 290

New York—Effective Jan. 1, ferromanganese, 78 to 82 per cent, was reduced $10 a gross ton to $75, duty paid, seaboard, in accordance with schedules announced in the early part of December. This reduction came as a result of tariff treaties with Canada and Brazil, both operative Jan. 1, with the Brazilian agreement affecting the ferromanganese price through its 50 per cent reduction in duty on manganese ore. Silicomanganese was reduced $5 a ton, Jan. 1. Domestic spiegeleisen, 19 to 21 per cent, is unchanged at $26, Palmerton, Pa., on lots up to 50 tons, and $24 on 50 tons and over. Quarterly contracting in these commodities has been general, and in ferromanganese good improvement in specifications is expected, as consumers have been taking in material sparingly for some time.

Nonferrous Metals

Nonferrous Metal Prices, Page 290

New York — General quietness ruled the nonferrous metal markets last week on account of the New Year's holiday. Through midweek prices were steady.

Copper—Despite light consumer buying during the final two weeks of the year, total sales of copper during December amounted to over 40,000 tons. All first hand sellers quoted on the basis of 9.25c, Connecticut, for electrolytic. The outlook is for renewed buying activity within the next two weeks.

Lead—Price tone of the lead market was steady with all producers through midweek quoting 4.35c, East St. Louis. Sellers generally feel the market is entering the new year in a strong position with substantial buying just ahead.

Zinc—Sellers were somewhat encouraged last week by the slightly firmer tone displayed in the London market which had fallen below the St. Louis equivalent. The domestic market through midweek was steady at 4.85c, East St. Louis, for prime western.

Tin—Buying was dull here but prices held fairly steady around 48.60c on Straits spot. Supplies are gradually becoming more freely available due to the higher export quotas.

Antimony—Supplies of Chinese spot antimony continued scarce with prices unchanged at 14.00c, duty paid New York, the level established Saturday, Dec. 28.. American antimony moved slowly at 13.25c, New York.

IT is a scientific fact that lamps marked with the GE monogram stay brighter longer than so-called cheap lamps. 480 checks and inspections in manufacture guard against the imperfections found in poor lamps—imperfections resulting in dollars wasted for current which is not converted into light.
General Electric's research and development have resulted in lamps of greatly improved efficiency and lower price. In the interest of better, more efficient work, you owe it to yourself, to your business associates, and to your employees to be sure that eyes are receiving adequate light for today's close seeing tasks . . . from lamps that *stay brighter longer*. For good light at low cost—for sight-saving light—always buy lamps with this mark GE.

EDISON MAZDA LAMPS

GENERAL ELECTRIC

General Electric manufactures lamps for home lighting and decoration, automobiles, flashlights, photography, stores, offices and factories, street lighting and signs. Also Sunlight lamps.

Steel in Europe

Foreign Steel Prices, Page 292

London — (*By Cable*) — Strength marks the opening of the new year in the steel and iron markets of Great Britain, and tightening is noted, especially in pig iron, scrap and fuel. Anxiety of producers is increasing in view of a possible strike in the coal fields. Billet producers are booked ahead for several months and some are refusing further tonnage. Specifications for heavy steel products are maintained. Industrial costs are expected to rise in 1936, with selling prices adjusted accordingly.

Continental steel producing countries report the situation is satisfactory, but hesitation due to political movements restricts the volume of forward business.

Equipment

Seattle — Pumps and compressors are in good demand as many cities in this territory are planning water system and sewage disposal projects. Logging activity and mining are restricted by seasonal conditions but the lumber industry is making some replacements during the holiday period. Bids were opened at Fort Peck, Mont., Jan. 3 for two tractor mounted cranes.

Iden Sees Building Recovery Slow

LOOKING into the 1936 market for structural material, V. G. Iden, secretary of the American Institute of Steel Construction Inc., New York, sees this situation shaping up:

"While no great increase in volume is anticipated during 1936, the steel construction industry looks forward to the coming year with a greater degree of confidence and hope.

"The steel industry has satisfied itself that there is in immediate prospect no great volume of sales for heavy products and therefore is concentrating its attention on the lighter products and the specialities.

"Fabricated structural steel, which is marketed chiefly for buildings and bridges, has not been in any great demand during the past four years. The volume of this material sold during 1934 was probably 15 per cent larger than the volume sold at the trough of the depression, but the volume sold during 1935 was not even so large as that sold in 1934.

Hope for 10% Increase

"The fact that this industry failed to sustain its upward trend during the past year is not considered particularly significant. It merely indicates that the recovery is going to be slow and gradual. If there is an increase of 10 per cent during the coming year the results will match today's expectations.

"What is more important, however, is the fact that the construction industry is not so immediately threatened with socialization. With the advent of PWA we anticipated a reasonable interference by the government, but with the advent of the civil works administration in 1934 and with WPA in 1935 the complete socialization of this industry was threatened. If President Roosevelt's promised 'breathing spell' means a halt to these threats the steel construction industry has sufficient cause to feel optimistic. For the experience of the past three years has definitely demonstrated that as rapidly as the government invades a field of endeavor, private capital flees.

"Government construction cannot hope to take the place of private con-

Fine finishes that save you time and money

Important among the many advantages resulting from Thomas specialized production is the perfection of finish which is instantly apparent in Thomastrip. Modern equipment and methods, painstaking skill and individual attention assures exacting quality for every specific requirement. Bright finishes are mirror smooth and free from spotty imperfections. Electro coatings of zinc, cadmium or copper are pure, dense and uniform — crack and flake-proof under deep forming or drawing operations. Investigate Thomastrip for your product. Without obligation a Thomas representative will gladly cooperate with you.

Send for test samples. Specify gauge, width, temper and finish desired.

THE THOMAS STEEL COMPANY
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COLD ROLLED STRIP STEEL
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struction. It would burden the government with too large a public debt to attempt it. That contracts for the fabrication and erection of structural steel are being let for private account once more is probably the most favorable indication. It portends a real recovery for the industry, and the only way by which recovery can be made lasting and actual. If this means that the day of post office building, of boondoggling, is past, then private capital may once more be coaxed back into activity.

"There is a tremendous housing shortage. The immediate need is for apartment houses and hotels in urban centers. Already factories are getting busy and building additions or new plants. This may soon be followed by a demand for new office space and a need for new commercial structures generally. The public utilities are in need of additional plants. Anticipating recovery from that direction the steel construction industry looks forward to 1936 with optimism."

Taylor Reviews Steel for 1935

REVIEWING events of 1935 and looking into 1936 for the steel industry, Myron C. Taylor, chairman of the board of the United States Steel Corp. says:

"We welcome the advent of the new year after six long years which have marked the great depression. In that period, the vicissitudes which follow subnormal production and consumption have found their most lamentable aspect in widespread unemployment, great shrinkage in the national income, and a steadily declining standard of living.

Steel Holds Self-Respect

"Through these trying years, the steel industry, as did industry in general, rose to great heights of effort and cooperation, and showed itself above political, class or personal prejudice. Its cooperation with all agencies that had as their objective any move toward recovery has been continuous and sincere, and looking back upon the record we of industry feel a conscious pride in having weathered this storm without serious sacrifice of self-respect or of the fundamental principles and philosophies under which our great nation has been developed to a position of unquestioned leadership among the nations of the world.

"It is evident that the steel industry has experienced a substantial recovery from the low point of the depression, and now seems in a fair way toward moving forward steadily —not rapidly perhaps, for there are

STEEL INDUSTRIES ENGINEERING CORP.

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"AMERICAN" ELECTRIC ROTARY CLAY GUNS
(More than 50 now in successful operation throughout the world)
NEW TYPE PIG CASTING MACHINES
"JOHNSTON" CORRUGATED CINDER POTS
LADLE SKULL REMOVERS
ELECTRIC ROTATING MANIPULATORS — for suspension from Crane Hook for handling Sheets, Sheet Bars, Billets, Slabs, Ingots, Ingot Molds, Wire Rod Coils, Sheet Strip Coils
SOAKING PIT TONGS MANIPULATOR
Any size or capacity
GRANULATED SLAG DEHYDRATOR
Including Special Equipment for Slag Handling in Open Hearth Department

For complete information regarding any or all of above equipment, or if you have a problem to be solved in your steel plant, consult us.

still many uncertainties to be reckoned with in this world of ours, uncertainties abroad and uncertainties at home.

"To asure a continuance of this improvement, we must constantly exercise the utmost caution, diligence and courage; we must employ unusual skill and constructive intelligence if we would avoid the many pitfalls that still lie ahead; we must not allow personal or political controversy to interfere with or destroy the gains that have been made.

"We must economize; we must shoulder all our individual and collective responsibilities; we must not shirk any of our duties. We must be willing to rely upon our own resources and not depend upon government to solve all of our economic ills. We must throw off and conquer that great fatigue which the stress of our many anxieties and our great efforts have put upon us. We must consolidate the advances we have made toward that level of recovery which would place our activities at a point at which the nation would be today had the normal growth of the century been maintained.

"We may confidently look forward to that day when the present economic readjustments shall have been completed and the normal pace of business activity is restored, for we have within our borders the greatest consuming market in the world.

"When that revival materializes, we may reasonably expect the steel industry to fully participate. In our modern civilization steel plays an indispensable part, and there is an irreducible minimum necessity for steel at all times, which is by no means inconsiderable, to replace that which wears out or is ravaged by nature.

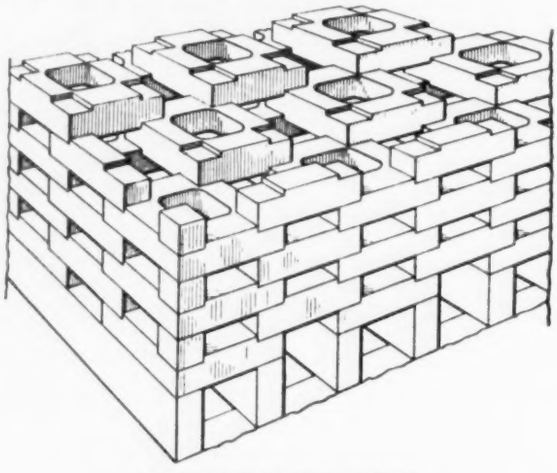
"Obsolescence implies tearing down and rebuilding. This occurs in the humblest homes as well as in the great industries—railroads, automobiles, construction, and the like. It is not conceivable that within the past six years the buying of steel has been of sufficient volume to compensate for that which in the ordinary course of events should have been replaced.

"In due time all such needs must manifest themselves, and the steel industry will not be found wanting in the character and quality of its manpower, the efficiency of its equipment, or spirit of cooperation or the desire to accomplish the greatest good for the greatest number, and will continue to be, as in the past, among our country's most formidable assets."

THE "SUPERIOR" OPEN HEARTH CHECKER

Is properly proportioned for efficient heat absorption and transmission.
It gives maximum heating surface per cubic foot of checker volume.
It eliminates all dead brick and therefore gives maximum flue area per horizontal checker area.

It has a low installation cost due to its design and method of laying



All bricks are interlocked as laid which give it strength and stability in the checker chamber

COMPARATIVE DATA
Using STANDARD Brick Shapes or "SUPERIOR" Open Hearth Checkers

Size of Flue	5" x 5"			6" x 6"				
Size of Brick	Standard 9x4½x2½" Flat	Superior 2½" Deep 2⅛" Walls	Superior 3" Deep 2⅛" Walls	Standard 9x4½x2½" Flat	Superior 2½" Deep 2⅛" Walls	Standard 9x4½x3" Edge	Superior 3" Deep 2⅛" Walls	Standard 10½x4½ x4½"
No. of Bricks per cubic foot	7.66	4.29	3.43	6.27	3.20	4.74	2.56	3.48
Free Downward Area per Horizontal Checker Area	28%	48.9%	49.3%	33%	52.5%	44%	52.7%	33%
Effective Heating Surface per cu. ft. (sq. ft.)	5.00	6.15	5.59	4.70	5.56	3.85	4.93	3.59
Square Feet of Heating Surface in 5,544 cu. ft. of Checker Volume	27,720	34,096	30,991	26,057	30,625	21,344	27,332	19,900
Percentage Increase in Flue Area over Standard Brick		75%	76%		60%	20%	60%	
Percentage Increase in Heating Surface over Standard Brick		23%	11%		18%	20%	47.4%	

WILLIAM M. BAILEY COMPANY
Magee Building *ENGINEERS* Pittsburgh, Pa.

Demise of NRA No Handicap to Steel

WALTER S. TOWER, executive secretary of the American Iron and Steel institute, reviews 1935 for the steel industry, as follows:

"Termination of the steel code in May, following the Supreme Court's decision, and the sustained recovery of demand and output which began in July, were two developments of outstanding importance in the steel industry in 1935.

"Any early fear that the ending of the code would have an adverse effect on steel mill activities or employment soon disappeared. Actually, production of steel ingots in the last half of the year exceeded that of the first six months by almost 9 per cent.

"For the full year, output amounted to almost 34,000,000 tons, the largest total since 1930 and an increase of 31 per cent over 1934. The extent of recovery which has been made since the turn took place is seen in the fact that in 1932, the low point, steel ingot production amounted to only 13,464,000 tons.

"During the first quarter of 1935, operations averaged 50 per cent of capacity, declining to 43.5 per cent in the second quarter. For the third quarter, the rate was 46.4 per cent of capacity. The last quarter, contrary to former seasonal trends, was the best of all with an average rate of 54.8 per cent of capacity. The

rate for the full year was 48.6 per cent, against 37.4 per cent in 1934.

"One factor making for improvement in the closing quarter was the advance in the date for introducing new automobile models and the increase in automobile production which resulted.

"Operations for the year served for the first time in five years to take the industry out of the red. However, with activities still limited to approximately one-half capacity, net profit margins continue to be uncomfortably narrow.

"During the first nine months of this year, leading companies in the industry representing more than 83 per cent of ingot capacity, reported earnings of 0.6 per cent on capitalization, compared with a loss of 0.2 per cent in the first nine months of 1934. From 1925 through 1934 leading companies in the industry showed average annual earnings of 2.5 per cent on capitalization.

"Although the rate of operations has failed to get back to a satisfactory level, the number of persons on the payroll has reached a total close to the top which marked the peak years of 1928-29. In October, the latest month for which figures are available, 436,500 persons were employed in the iron and steel mills, compared with 381,400 in October, 1934, and with a low point of 210,000 in 1932. Total payrolls for the year are estimated at $550,000,000 compared with $457,843,000 for 1934.

"The average hourly wage rate in the industry during the year was 65.5 cents or approximately 10 per cent higher than the average for all other industries, and 38 per cent higher than in June 1933. Because of the continued below-normal activities, the large number of employes on the payrolls reflects the extent to which work sharing was still a factor in the industry in 1935. Average weekly earnings of employes for the year increased 20 per cent over 1934, but as a result of limitation on hours, they still remained below 1929 levels."

Bar Iron Wages Steady

Wage rates in bar iron mills having contracts with the Amalgamated Association of Iron, Steel and Tin Workers will remain unchanged for January and February, no change having occurred in average sales prices during November and December. The card rate for the next bimonthly period is 2 cents on boiling, or puddling, bar, and 12-inch mills, and 2.10c on guide and 10-inch mills.

W. J. Snow & Co., Cleveland, has been appointed representative for Forty-Eight Insulations Inc., Aurora, Ill., maker of insulating cement.

Belgium's Imports of Iron, Steel Decline in 1935

Belgium's import trade in iron and steel products declined appreciably in 1935, a report to the commerce department from the commercial attache at Brussels reveals.

During the first nine months of 1935 imports of the principal iron and steel products into Belgium totaled 227,904 metric tons, compared with 278,327 tons in the corresponding period of 1934, statistics show.

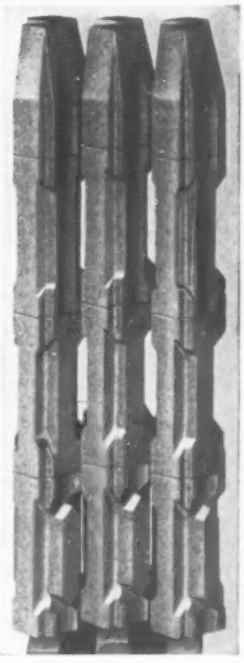
The most important decreases involved imports of ferroalloys and scrap. France suffered most from these declines; imports of ferroalloys from this source decreased from 13,035 tons to 7312 tons, and imports of scrap from 61,938 to 38,283 tons.

On the other hand, imports of ferroalloys from Norway increased from 8830 tons to 13,478 tons.

Wheeling Registers Bonds

Wheeling Steel Corp. has filed a registration statement with the Securities Exchange commission cov-

THE AMERICAN OPEN JOINT CHECKER



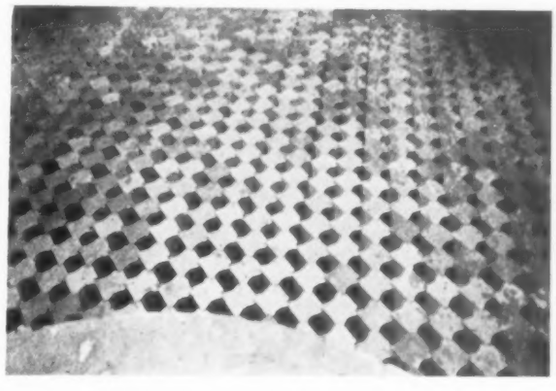
Maximum weight in top section of stove to withstand maximum temperature (without melting down) and absorb and transfer maximum heat.

Complete cross-circulation equalizes flow of gas through entire checker chamber. No clogged or dead flues.

Maximum heating surface per cubic foot of volume for any desired flue diameter.

Minimum cost per square foot of heating surface.

Operating charts prove conclusively all heating surface is active.



Four installations in last 3 years prove their efficiency.

* * * * *

Let us reduce your capital investment on Blast Furnace Stoves

WILLIAM M. BAILEY COMPANY
ENGINEERS
Magee Building Pittsburgh, Pa.

ering $35,000,000 first mortgage sinking fund 4½ per cent bonds due in 1966, revealing that $16,008,900 will be used to redeem all the outstanding Series B bonds at 102, $14,000,000 to discharge indebtedness to various banks, $2,000,000 for plant additons and improvements, and the balance for working capital.

Is Pittsburgh Representative

Consulting Engineering Co., No. 1 Terminal office building, Carson street, Pittsburgh, has been appointed representative in the Pittsburgh district for Pennsylvania Pump & Compressor Co., Easton, Pa. The management of the Consulting Engineering Co. consists of J. F. Tutein and T. G. McCann.

Bethlehem Starts Mill

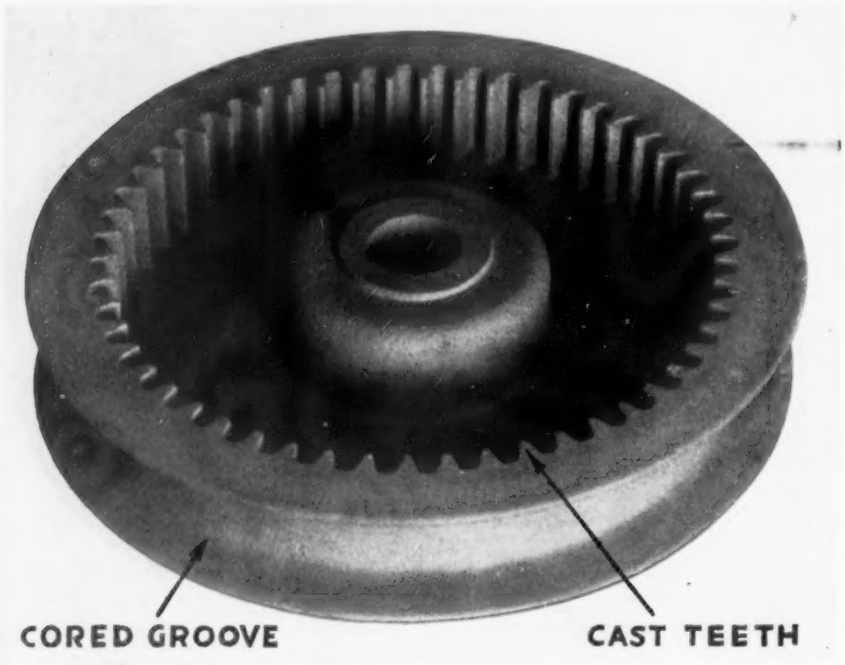
Beginning of production on Bethlehem Steel Co.'s new strip mill at Lackawanna, N. Y., was accomplished over the past week without incident. The hot metal unit started producing at noon a week ago Sunday and has been continuing since. Operations are said to be satisfactory. The old Seneca unit will continue on a 90 per cent schedule for some time, according to reports. The best estimate of the time for beginning production in the new cold mill is early spring.

Sharon Steel Hoop Co. To Adjust Capital, Name

Sharon Steel Hoop Co., Sharon, Pa., has called a special stockholders' meeting Feb. 27 for refunding its outstanding $5,328,000 of 5½ per cent Series A bonds, to recapitalize the company, and to change its name to the Sharon Steel Corp.

Changes in the capital stock structure will result in an increase to 1,070,000 shares authorized, of which 1,000,000 shares will be common and 70,000 shares, preferred. At present the company has no preferred stock, and the authorized common stock amounts to 500,000 shares with 375,000 shares outstanding.

The company also proposes to reduce its stated capital from $9,875,000 to $3,750,000 and to increase its authorized indebtedness by $7,000,000.



Cut Tooth Pinion Meshes with Cast Teeth in Drum Necessitating Very Close Tolerances

ACCURATE ELECTRIC STEEL CASTINGS

Specializing for over a quarter of a century in light section intricate castings of the highest quality.

TUFALOY — An Alloy Steel in various grades depending on service requirements.

FORT PITT Austenitic Manganese Steel.

DENSALOY — Electric Furnace Iron for special purposes.

FORT PITT One Piece Cast Steel Flasks.

All Regular and High Carbon Steel Castings.

Any Heat treatment desired.

— Write for Bulletins —

FORT PITT STEEL CASTING COMPANY

McKeesport, Pa.

Production

STEELMAKING rose 1½ points last week to 49 per cent, reflecting heavier schedules in four districts. Youngstown was up 3 points to 59 per cent; Pittsburgh, 4 points to 38 per cent; Cleveland, 32 points to 72 per cent, and Buffalo, 3 points to 50 per cent. Chicago declined 3 points to 47 per cent, New England was off 2 points to 75 per cent, while other districts remained firm. Details follow:

Chicago—Declined 3 points to 47 per cent, lowest rate since early July. Finishing mill schedules are at a relatively higher rate than ingot production, and open-hearth operations are expected to hold around the present level until about the middle of January. Several blast furnaces, banked for a short time during the holiday week, have been put back in service, and the lighting of one additional unit gives the district 20 active stacks out of 41.

Pittsburgh—Up 4 points to 38 per cent last week as ingot schedules reverted more closely to normal. A leading interest operated at 36 per cent last week, an individual gain of 2 points. Twenty-six out of 60 steelworks continue active. Carnegie-Illinois has 12 on, Jones & Laughlin, 6, and Pittsburgh Crucible Steel, American Steel & Wire, and National Tube, 1 each. Bethlehem, at Johnstown, Pa., still has 3 on.

Wheeling—Steady at 70 per cent

last week. Twenty-six open-hearth furnaces out of 37 are in operation.

Birmingham—Held at 56 per cent last week, with 12 open-hearths continuing active.

New England—Down 2 points to 75 per cent, with a rebound expected shortly.

Cleveland-Lorain—Up 32 points to 72 per cent. National Tube Co., Lorain, relighted 11 open-hearths after a week's suspension; Republic Steel Corp. operated 9, and Otis Steel Co., 8. Open hearths and finishing capacity were operated New Year's day. Republic blew out one of its four active blast furnaces in midweek.

Central Eastern Seaboard—Down fractionally to 34 per cent last week, with expectations of a slight rise this week.

Steelmaking Operations

Percentage of Open-Hearth Ingot Capacity Engaged in Leading Districts

	Week ended Jan. 4	Change	Same week 1935	1934
Pittsburgh	38	+ 4	25	22
Chicago	47	— 3	47	34
Eastern Pa.	34	—½	23½	22½
Youngstown	62	+ 3	53	32
Wheeling	70	none	80	56
Cleveland	72	+32	77	51
Buffalo	50	+ 3	39	29
Birmingham	56	none	27½	52
New England	75	— 2	68	95
Detroit	88	none	59	79
Average	49½	+1½	42½	31

Died:

J. G. OBERMIER, 75, vice president in charge of production, Timken Roller Bearing Co., Canton, O., and one of Ohio's leading industrialists, at Tucson, Ariz., Dec. 29. He was born in Cleveland and at the age of 16 joined the Cleveland Axle Co. He went to Canton more than 30 years ago, having been assigned to build the Canton plant of the Cleveland Axle Co., and remained there as superintendent of the Canton plant. He became production manager of the Timken Roller Bearing Co. 24 years ago, and later was elected vice president in charge of production.

♦ ♦ ♦

Robert Edwards, 63, president, Edwards & Co. Inc., Bronx, N. Y., in New Rochelle, N. Y., Dec. 26.

♦ ♦ ♦

Dwight Clark, 66, of Washington, and a director of the Jones & Laughlin Steel Corp., Pittsburgh, in Philadelphia, Dec. 26.

♦ ♦ ♦

William H. Mateer, 55, director of purchases, Pullman-Standard Car Mfg. Co., Butler, Pa., Jan. 1.

♦ ♦ ♦

Otto Kehrer, for nearly 20 years superintendent of the Acme Malleable Iron Works, Buffalo, in that city recently.

♦ ♦ ♦

Charles L. Kochendarfer, 73, associated with the Tyler Tube & Pipe Co., Washington, Pa., from 1892 to 1925, near Claysville, Pa., Dec. 26.

♦ ♦ ♦

Jack Espen, Espen-Lucas Machine Works, Philadelphia, in that city, Dec. 22.

♦ ♦ ♦

H. L. Tredennick, president of Haws Refractory Co., Johnstown, Pa., at Johnstown, Dec. 30.

♦ ♦ ♦

Charles L. Hodgson, 48, vice president and general superintendent, Doehler Die Casting Co. Batavia, N. Y., in

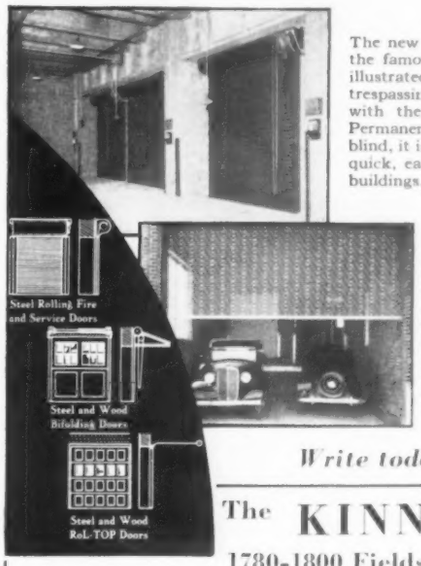
KINNEAR
Rolling Doors

FOR ANY INDUSTRIAL OPENING

Opening Upward They Are Out of the Way

25 to 30 years of dependable daily service! That's the kind of service records that have made Kinnear Steel Rolling Doors famous to industry—unequalled for low maintenance cost. Operating like a window blind, they open or close easily and quickly—save valuable space and labor time—and are always out of the way. And these economies can be applied to any opening. All of Kinnear Doors open *upward* and have the same durable construction, though offered in various designs to meet any condition.

Whether you require doors of wood or steel (or other metals) for service or protection against fire or riot—operated manually or mechanically—for old or new buildings, there's a Kinnear Door to fit.



Rolling Grilles

The new design of Kinnear Rolling Grille operates like the famous Kinnear Steel Rolling Door . . . both are illustrated. It is just the thing to prevent pilfering, trespassing or intrusion. Provides an impassable barrier, with the added advantage of light, air and vision. Permanently installed and operated like a window blind, it is out of sight when open—but always ready for quick, easy closure. Built in any size, for old or new buildings. Ask for the details.

Bifolding Doors

Kinnear's No. 3 Bifolding Door is ideal for heavy duty warehouse use. Allows for the admittance of light. The two sections telescope vertically and then raise overhead, out of the way. Weight counterbalanced. Provided with ingenious Safety Lock. Tell us of the problem and let us show you how this door will do the job. For the purpose intended it is the most modern door on the market.

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The KINNEAR MFG. CO.
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Please send us your catalog on Kinnear Rolling Doors and Door Equipment. We are particularly interested in equipment for:

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that city, Dec. 29. Mr. Hodgson was president of the Batavia chamber of commerce and took part in many community activities.

Men of Industry

FRED E. KLING has been appointed assistant chief engineer of Carnegie-Illinois Steel Corp., with headquarters in Pittsburgh. He is a veteran Carnegie Steel Co. employe, and following graduation from the Royal Engineering college, Dortmund, Germany, he entered the employ of Carnegie Steel Co. at Youngstown, O., in October, 1902, as a draftsman and steam engineer. Four years later he was made assistant chief engineer at the Youngstown works and held the position of chief engineer there from November, 1912, to October, 1930. On the latter date he was made chief mechanical engineer of Carnegie Steel Co., and on Oct. 1, 1935, was made chief engineer of the Pittsburgh district. Sydney Dillon continues as chief engineer of Carnegie-Illinois.

Louis C. Edgar, chief engineer at the Edgar Thomson works, Braddock, Pa., of Carnegie-Illinois, has been appointed chief engineer for the Pittsburgh district. Mr. Edgar entered the employ of Carnegie Steel Co. at the Edgar Thomson division in 1905 as a draftsman, was appointed assistant chief engineer in 1907, and chief engineer in 1916. He is a former president of the Engineers' Society of Western Pennsylvania and has been a director of the Association of Iron and Steel Engineers.

Warren C. Hall, assistant general superintendent at the South works of the former Illinois Steel Co., has been appointed chief engineer in the Chicago district for Carnegie-Illinois. He is a graduate of Purdue university and has been identified continuously for the past 24 years with the Illinois Steel Co. in various engineering departments.

Charles R. Moffatt, who has been director of advertising for the former Illinois Steel Co for the past 16 years, has been appointed advertising manager of Carnegie-Illinois with headquarters in the Carnegie building, Pittsburgh.

G. Reed Schreiner, identified with the advertising department of Carnegie Steel Co. since January, 1919, has been appointed assistant advertising manager of Carnegie-Illinois.

◆ ◆ ◆

E. O. Brady, formerly sales manager of the Stran Steel Corp., Detroit, has been appointed regional

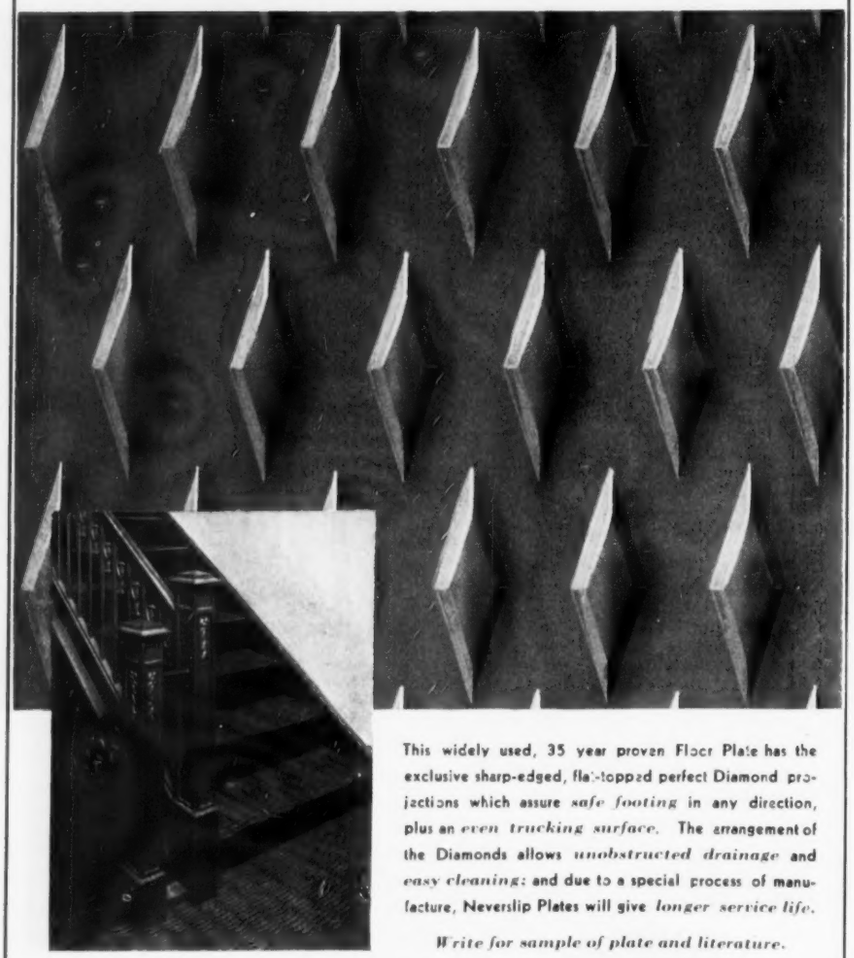
G. S. Crane

Who as noted in STEEL for Dec. 2 has been named a vice president of Cutler-Hammer Inc. He will continue as sales manager. He has been with the company over 25 years

NEVERSLIP

ROLLED STEEL FLOOR PLATE

prevents slippage of foot or wheel



This widely used, 35 year proven Floor Plate has the exclusive sharp-edged, flat-topped perfect Diamond projections which assure *safe footing* in any direction, plus an *even trucking surface*. The arrangement of the Diamonds allows *unobstructed drainage* and *easy cleaning*; and due to a special process of manufacture, Neverslip Plates will give *longer service life*.

Write for sample of plate and literature.

American Pressed Steel Co.
Commercial Trust Bldg.
Phila., Pa.

NEVERSLIP

W. C. Stevens

Who as noted in STEEL for Dec. 2 has been named a vice president of Cutler-Hammer Inc. He will continue as chief engineer. He has been with the company more than 25 years

manager for the plumbing ware division of the Briggs Mfg. Co.

In his new connection, Mr. Brady will represent Briggs in the southern territory, comprised of North and South Carolina, Georgia, Tennessee, Alabama, Mississippi, Florida, and eastern Louisiana.

♦ ♦ ♦

Erwin R. Holtz has been appointed to take charge of the accounting and cost departments of the Wrought Washer Mfg. Co., Milwaukee. He comes to his new position with 20 years of varied experience in the field of executive and accounting administration. He was formerly assistant treasurer of Freeze, Vogel & Crawford Inc., advertising agency. Prior to this he was in charge of the factory cost department of the Waukesha Motor Co. He is vice president of the Milwaukee Society of Accountants.

Henry T. Lathrop

Who is now manager of sales, Electronic Control Corp., Detroit. He formerly was identified with the Detroit office of Pickands, Mather & Co.

♦ ♦ ♦

Fred E. Gage, superintendent of the Farrell division of American Steel & Wire Co., Farrell, Pa., has been made superintendent of the Consolidated works of the company, Cleveland. Mr. Gage secured his early training at the Central works of the company, Worcester, Mass. He became assistant superintendent of the Rankin works in 1916, and later was made superintendent of the Donora wire works. In October, 1922, he was named superintendent of the company's Farrell, Pa., plant.

E. F. Brown, former superintendent of the Consolidated works of American Steel & Wire Co., has been made superintendent of the American works, Cleveland, succeeding C. M. Kempert, who has retired.

♦ ♦ ♦

Rueben D. Abbiss, formerly assistant chief engineer at the Edgar

AIRLESS ABRASIVE CLEANING

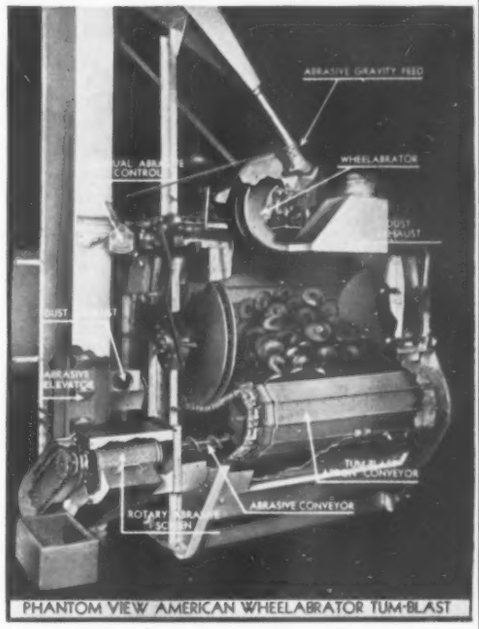
150 satisfied users of the American Wheelabrator Tum-Blast, Cabinet or Multi-Rotary Table, can't be wrong.

This airless abrasive cleaning and preparation equipment has proved its economy and efficiency in all types of metal working plants. Wheelabrators are now cleaning iron, steel and malleable castings; descaling forgings; cleaning steel sheet, tubing and billets; and preparing non-ferrous metals.

Surveys of installations in a variety of plants have shown cleaning and preparation cost reductions of more than 50% over other methods.

The Wheelabrator utilizes only 15 H.P., instead of 150 H.P. needed for operating obsolete equipment—made obsolete since the inception of the WHEELABRATOR.

Investigate!



PHANTOM VIEW AMERICAN WHEELABRATOR TUM-BLAST

AMERICAN PRODUCTS ARE:

- Sand Cutters
- Dustube Dust Collectors
- Flasks and Jackets
- Core Machines
- Rod Straightener
- Sand Blast Equipment
- Abrasives

Send for literature now!

The American Foundry Equipment Co.
641 Byrkit St., Mishawaka, Ind.

WHEELABRATOR

Thomson works of the Carnegie-Illinois Steel Corp., has been appointed chief engineer, succeeding Louis C. Edgar.

• • •

Richard M. Smith, formerly with Dodge Mfg. Co., and Jerome E. Sweet, formerly with American Foundry Equipment Co., both of Mishawaka, Ind., have joined the Claude B. Schneible Co., Chicago.

• • •

Benjamin P. Talbot has been appointed senior contracting manager for American Bridge Co., Pittsburgh, succeeding Edward B. Stearns, who is retiring after more than 47 years of continuous service. Mr. Talbot's headquarters will be in New York. Other changes are:

William H. Kann, appointed contracting manager in the Cincinnati district succeeding H. M. Knapp, who is retiring after 39 years of continuous service.

Carl H. Sander, appointed contracting manager in the central district, comprising northwestern Ohio and Detroit areas, succeeding J. C. Munn, of the Detroit district, who is retiring after more than 47 years of continuous service, and C. P. Mettler, of the Ohio area, who is retiring after more than 40 years of continuous service.

David E. Faust, appointed contracting manager at Duluth.

All of the above changes became effective Jan. 2.

• • •

H. C. Armin has been appointed by the Michiana Products Corp., Michigan City, Ind., to represent it in the New England states and New York. His headquarters for the present are at 754 East Twenty-third street, Brooklyn, N. Y.

• • •

Benjamin C. Bradford, who has been district sales manager of the St. Paul office of the Inland Steel

J. M. Highducheck

Who has been appointed district manager of the midwestern territory for American Cutting Alloys Inc., New York, with headquarters in Detroit, as reported in STEEL for Dec. 23

Irvin J. Sanne

1892 **PIONEERS** 1936

IN

Blast Furnace Copper Castings
Including Tuyeres, Coolers,
Bosh Plates, Valves and Seats

Mill Bearings
Machinery Bronze
Housing Nuts
Pickling Crates

Heavy Closed Bottom Tuyere Cocks
Standard Bronze Unions

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Quality and Service
Are Factors in Your Buying

Let Us Quote

LAWRENCEVILLE BRONZE CO.
Bessemer Bldg. Pittsburgh, Pa.

Co., Chicago, for the past 32 years, is retiring early in January.

Mr. Bradford has spent all of his business career in the Twin Cities, and served as purchasing agent for the Minnie Harvester Co. and American Grass Twine Co., St. Paul, prior to his affiliation with the Inland company.

Ervin J. Sanne has been appointed to succeed Mr. Bradford as district sales manager. He formerly was associated with the sales department of Joseph T. Ryerson & Son Inc., Chicago.

• • •

R. A. Donaldson has been appointed metallurgist of the Woodward Iron Co., Birmingham, Ala. Born in Birmingham, he received his education in the public schools there and at State Teachers college, Jacksonville, Ala.

He began his career in the chemical laboratory of the Woodward Iron Co. in 1921, and later served in the research and also control laboratory of the United States Pipe & Foundry Co., Birmingham. In 1926 he was appointed metallurgist at its plant at Anniston, Ala., and continued in that capacity until the plant was closed in 1928. He was then appointed chemist and metallurgist of National Cast Iron Pipe Co., Birmingham, a division of J. B. Clow & Sons, serving in that capacity until 1933. He then became connected with Sloss-Sheffield Steel & Iron Co., Birmingham, in sales and foundry consultant work.

Mr. Donaldson will be occupied principally in foundry consultant work for the Woodward pig iron agents—Miller & Co., in the Chicago, St. Louis and Cincinnati territory, and for F. W. Marshall & Co., along the eastern seaboard.

• • •

H. D. Stalnaker, Pittsburgh representative for Continental Iron & Steel Co., New York, has severed his connection with the Continental company and entered the iron and steel scrap business with his own concern located at Pittsburgh.

Mr. Stalnaker is well known in the scrap and steel trades, and with the revival of the Stalnaker Steel Co. he will bring back a prominent scrap iron organization of several years ago. The Stalnaker Steel Co. was formed in 1917 and continued until 1928. H. D. Stalnaker represented the firm in Pittsburgh and his brother, H. G. Stalnaker, in Cleveland. After several years in California, H. D. Stalnaker returned to Pittsburgh in 1933.

New offices will be at 902 Keenan building. H. D. Stalnaker is president and treasurer of the company, and his son, Joseph H. Stalnaker, is vice president. G. A. Sisk is secretary.

Canadian Output Best Since 1930

SEVERAL interesting developments appeared in the Canadian iron and steel industry last year, and production of pig iron, steel ingots, castings and ferroalloys, was at the highest level since 1930.

With regard to prices, however, there was comparatively little change throughout the year, although several advances in scrap prices were made during last half as foreign and domestic demand competed for tonnage. However, the general level did not rise far.

While heavy purchases of sheets, castings, and other steel lines by the automotive industry largely were responsible for betterment in the steel industry, placing of the $15,000,000 rail and equipment orders by the Canadian National and Canadian Pacific railways also played an important part in the general im-

The second Chemico Installation for producing Sulphuric Acid from Waste Iron Sulphate Liquor

THIS second installation is similar to the first—and for the same owner, but erected at a different plant to give this second plant the same savings and dependable acid supply as the first. The success of both installations has turned an ugly disposal problem into highly desirable recovery at a good return on the capital outlay.

Conversion of the sulphur content of spent pickling liquor into fresh acid by the Chemico Process is intensely practical for any steel mill producing large quantities of pickling liquor.

How the process operates

The spent pickling liquor is evaporated, with simultaneous neutralization of any free acid, to produce a dehydrated ferrous sulphate which is decomposed by heat into strong sulphur-dioxide gas and dry granular iron oxide. The gas is purified and converted into sulphuric acid in a contact acid production unit employing long-lived vanadium catalyst. Operation is continuous and the equipment is sealed throughout to prevent the escape of fumes.

Advantages: Maximum practical acid recovery—No further concentration or purification necessary—Independence of outside acid supply—Low labor expense—No economic loss—Disposal problem eliminated—No waste residues or pollution to invite controversy with authorities.

We design the plant to meet existing conditions, contract for erection complete including equipment, and deliver the installation with operating crew fully trained. Every contract is based upon rigid operating guarantee, and acceptance is contingent upon a satisfactory test run.

The Chemical Construction Corporation has designed and erected over 100 prominent foreign and domestic plants for sulphuric acid production, concentration and recovery, and has on its staff internationally recognized authorities on industrial sulphuric acid problems.

Give us the data on your pickling liquor problems and let us suggest proper equipment.

"Chemical Plant Control Data"

This 88-page compilation of information on sulphuric, hydrochloric, nitric, and phosphoric acid, ammonia, etc., will be sent free to executives and chemists who apply on company letterhead and state official position.

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CHEMICAL CONSTRUCTION CORP.

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Canadian Production of Iron and Steel

	Gross Tons			
	Pig iron	Steel ingots	Steel castings	Ferro-alloys
1923	880,018	839,710	45,060	29,961
1924	593,024	625,175	25,515	26,400
1925	570,397	733,855	18,840	25,709
1926	737,503	745,550	33,338	57,416
1927	707,697	867,928	39,710	56,230
1928	1,037,727	1,190,001	44,718	44,882
1929	1,090,244	1,309,543	70,145	80,010
1930	747,178	957,430	54,313	65,223
1931	420,038	664,826	37,055	46,764
1932	144,130	312,360	22,915	15,487
1933	227,315	394,059	15,920	30,133
1934	406,955	738,430	20,640	33,085
1935 (a)	585,627	897,870	31,360	55,520

(a)—December production figures estimated.

provement. A number of equipment plants that had been idle or practically shut down for several years resumed operations, and all now have sufficient backlogs for several months. Announcement is made that National Steel Car Co., Hamilton, Ont., had just closed $300,000 in new business, bringing its order book to more than $3,000,000.

Steel mills opened the year on a basis of about 40 per cent of capacity and closed with the rate in excess of 60 per cent. Foundries advanced from 25 per cent to better than 50 per cent and similar improvement was manifest in various other lines of iron and steel.

The accompanying table shows the definite upswing in production of iron and steel for the past year, with comparative figures from 1923 to 1935 inclusive.

Financial reports also showed substantial improvement in earnings, and from officials of a number of concerns it is learned that with present backlogs 1936 will show much further advancement in operation and earnings.

Use of Welded Products Extended

(*Continued from Page* 216)

lene process lend themselves particularly to satisfactory fabrication of Class I pressure vessels.

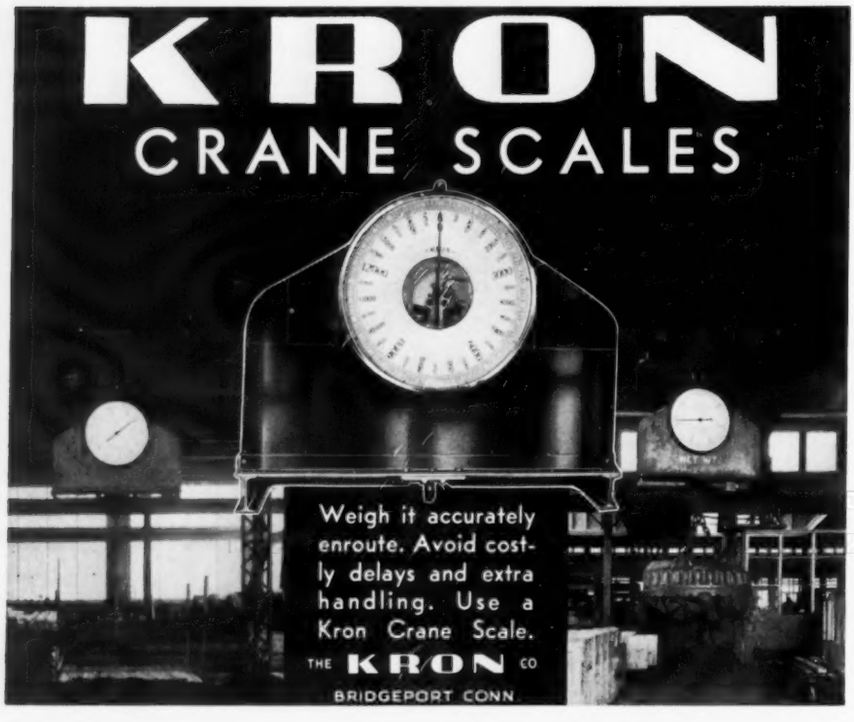
Production of closed automobile bodies constitutes one of the new applications for oxyacetylene welding, state engineers of the Air Reduction Sales Co., New York. One manufacturer is now employing gas welding and spot welding almost exclusively. Fabrication of bases, frames, and other major parts for machinery from rolled steel has created new uses for gas cutting. Improved cutting tips have reduced cutting costs and are producing surfaces which require little if any machining.

Some progress has been made in hand torch cutting stainless steels, particularly the heavier sections, by using a specially developed technique. Machine cutting has been improved also by employing low-carbon steel deposits on the face of the stainless steel; these deposits act as kindling to start and maintain cutting action. Cuting is becoming a standard method of removing risers from steel castings. Riser design and location is favoring this method of removal and special cutting tips are making subsequent grinding unnecessary.

Torch Scarfing Billets

Continuing their comment, Air Reduction engineers state that deseaming of billets is looked upon with more favor with the introduction of multiple torch machines which in one pass will remove the top surface of a billet at speeds up to 1 square foot per second. Speed welding with a slightly carburizing flame has been accepted as standard practice for welding pipe lines, and is responsible for a change in the method of laying lines.

Considerable progress has been made by the oxyacetylene process in production extremely high-strength welded tubes for mechanical purposes; cost has been reduced and speeds approximately doubled. Flame hardening has lately acquired new impetus and special water-cooled torches with tips as wide as 6 inches and containing over 50 heating flames have been developed. Concluding their statement, Air Reduction engineers report that in the field of flame machining, special tips and torches are being developed for preparing steel plate in the heavier sections for fusion welding.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SOLVING the problem of welding 18-8 chrome-nickel steel was a valuable contribution to many industries, comments W. J. Priestley, vice president, Electro Metallurgical Co., New York. Addition of small amounts of columbium to this steel made its use possible under conditions where corrosion and oxidation at high temperatures had been limiting factors. Columbium-bearing stainless steels are now used for welded equipment subject to corrosion without the necessity of annealing after welding.

According to C. L. Ipsen, industrial heating section, General Electric Co., Schenectady, N. Y., widespread interest has been manifested during the past year in the electric furnace method of brazing steel as-

semblies. This economical method of joining complicated steel parts with joints equaling the strength of the parent metal, he says, promises to be one of the most fertile fields for future furnace application.

Weld testing has progressed during the past year by gradual development, reports R. B. Lincoln, director, National Weld Testing Bureau, Pittsburgh Testing Laboratory, Pittsburgh. Testing is of commercial importance, because it brings about a better product, or one of equal value at less cost. In Mr. Lincoln's opinion, tests are justified to insure safety, to make welding acceptable in place of more costly construction, and to permit more economical use of welding.

Tests Should Be Reasonable

The correct size weld of known quality usually costs less than oversize welds of unknown quality made to obtain the same degree of safety. Tests should be adequate, but not unnecessarily costly. In the past, says Mr. Lincoln, unnecessary repetition of tests has resulted in unnecessary costs in some cases. The first difficulty has been corrected by recently adopted codes; the second can be avoided by conducting the tests so that there can be no doubt as to their validity.

Welding and riveting are competitive fabricating methods, particularly in heavy construction, such as special machinery, buildings and bridges. For that reason, biased and unfair statements concerning the merits of the two processes are heard frequently. As more experience is accumulated with the newer process of welding, engineers are able to compare welding and riveting more sanely.

F H. FRANKLAND, technical director, American Institute of Steel Construction, New York, points out during 1935 the institute has made available in this country translations of German research work on riveted and welded joints and the dissemination of this information is producing a deep and far-reaching effect on our design considerations for both welded and riveted structures. An important contribution to our knowledge of riveted construction will be publication by the American Society of Mechanical Engineers of its complete and critical review of riveted joints.

As may have been expected, says Mr. Frankland, advances in welding structural steel recently have been more notable than those in riveting; however, use of ⅞-inch rivets as standard has grown steadily because of general economic considerations, such as fewer holes to be drilled or punched and fewer rivets necessary for connections of a given strength. The ¾-inch and smaller rivet will continue to be used, of course, for jobs where the larger rivet is not economical or by shops not equipped to take advantage of the economies offered by the larger rivets.

During the year, increased attention has been paid to possibilities in the use of cold-driven rivets for bridge and building work. It is likely that during the coming year there will be serious consideration of a specification for cold-drawn rivets in the structural field.

Probably the most important advance ever made in this country in use of welded structural steel is the work of the Am an Welding society's committe a specifications for use in the design, construction strengthening and repair of railroad and highway bridges. Much that was known of welding technology, even 3 or 4 years ago, has been superseded, Mr. Frankland points out. This rapid development therefore calls for sound engineering judgment and clear thinking when evaluating available technical data. Fundamental princinples of welding are such that no precedents can be adopted from other forms of construction, and it therefore follows that creative originality and inventive genius are

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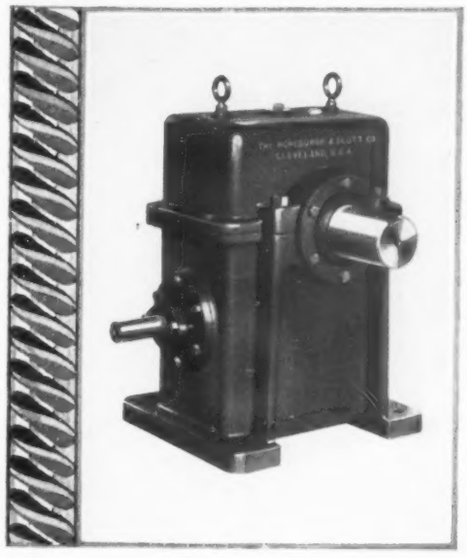

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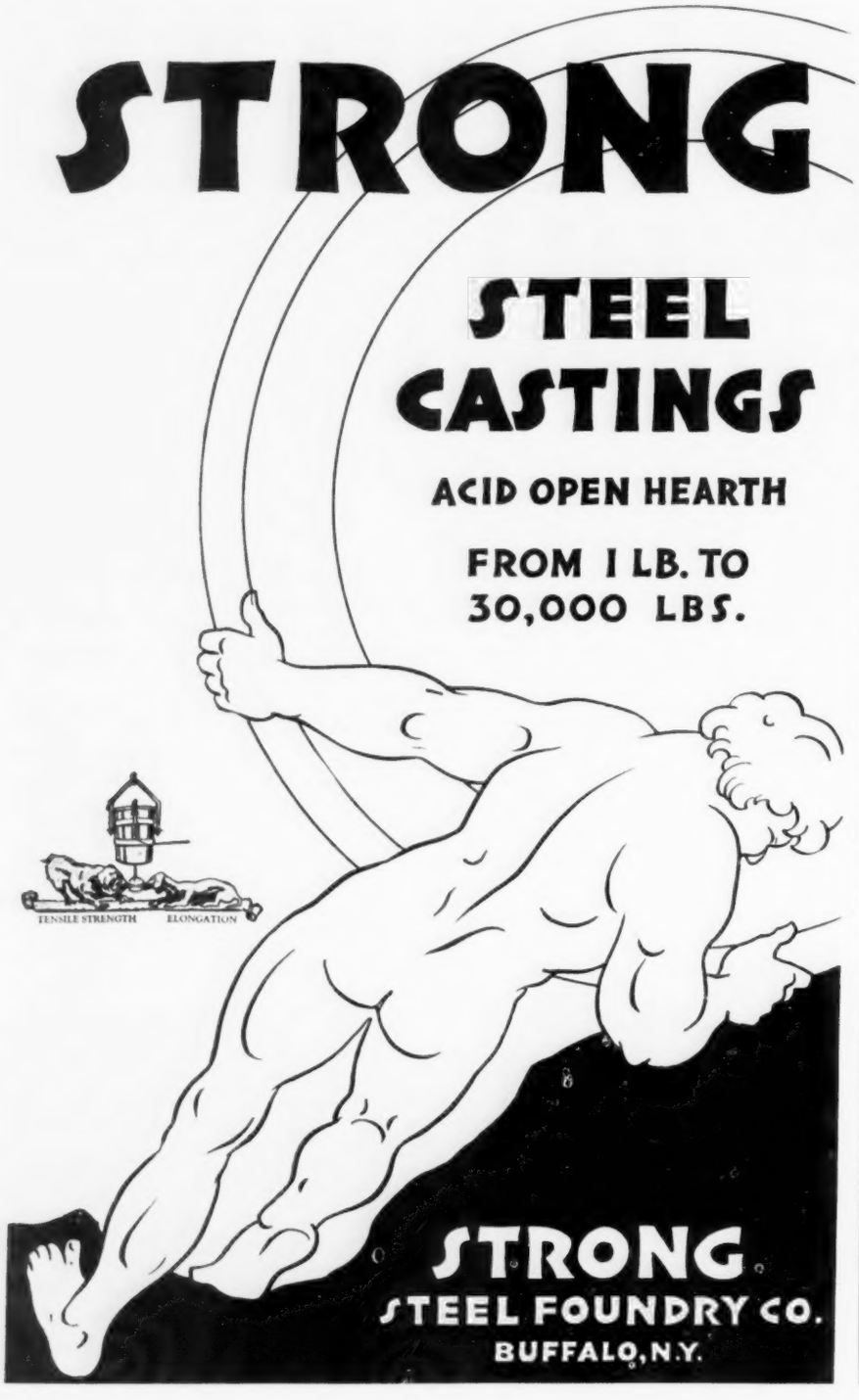
necessary in the engineer engaged in design and construction of welded bridges.

So far as rivets themselves are concerned, there is nothing very new, observes Pierre Champion, president, Champion Rivet Co., Cleveland. As noted last year, the navy department and other rivet users have cut down tolerances of holes, thus making it necessary to have rivets more accurately made. Not so many years ago, standard practice was to ream holes 1/16-inch oversize; today this has been reduced to 1/32-inch; this closer tolerance is almost universal in the steel fabricating industry. The result is to increase the cost of rivets, because of the short die life and more accurate workmanship required.

There is at present considerable agitation both for and against riveting and rivets versus welding in connection with the building construction. Also, there are noise abatement programs of one kind or another, all of which bring this matter vividly before use. What the outcome will be, only time can tell, says Mr. Champion.

The most interesting development in some little time, he points out, is a portable hydraulic riveter which will drive ⅝-inch diameter rivets cold at the rate of 25 per minute. This should be a great boon to the automobile makers and other manufacturers requiring production riveting.



Heat Treating More Precise

(*Continued from Page* 218)

hin, Vanadium Corp. of America, Bridgeville, Pa., have recommended an alloy composition without aluminum that can be cast successfully and after nitriding gives values which are comparable to those obtained for aluminum-containing material.

The fact that many of the newer low-carbon modifications of malleable iron, graphitize more rapidly than malleable iron and that they are frequently used in a definite state of incompleteness of graphitization has made for the use of short-cycle heat treating furnaces in foundries, observes H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland.

These furnaces, continues Mr. Schwartz, are not essentially different from many formerly used for heat treatment of steel, but the devoting of more attention to control of a particular desired cooling rate constitutes something of a novelty to foundrymen. It is not at all impossible that the next demand will be for adaptation of a controlled atmosphere to these furnaces.

Atmospheres Better Understood

The general optimism which first characterized the introduction of commercial atmosphere control in furnaces for hardening steel is now somewhat restrained by specific information on what cannot be done as well as on what can be done profitably with it, in the opinion of Howard Scott, special problems section, metallurgical division, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. He states that the relative standing of the continuous bright normalizing furnace has been considerably advanced during the past year and recent developments indicate further gains for it.

Bright normalizing furnaces are also made the subject of comment by R. R. LaPelle, industrial heating section, power engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The first continuous electric furnace for bright normalizing autobody steel in strip form went into service last summer. It operates at 1750 degrees Fahr. and produces 5 tons per hour.

Another interesting development of the year was the electric bell-type furnace provided with a fan in the furnace bases to accelerate heating

and cooling. One notable installation comprises 26 units for bright annealing cold reduced strip, each unit annealing a charge of 16 tons with an approximate heating cycle of 20 hours and a cooling cycle of 30 hours, says Mr. LaPelle.

C. L. Ipsen, industrial heating section, General Electric Co., Schenectady, N. Y., reports the installation by one of the large steel companies of a battery of bell-type car-bottom electric furnaces for heat treating alloy bar stock. The insallation provides for complete automatic handling of a 10-ton charge of 30-foot bars on any one of ten treatments which the operator can select on a master switch.

Increasing use and possibilities of flame or torch hardening proves impressive to H. S. Rawdon, chief, division of metallurgy, national bureau of standards, Washington. The application of this method to large pieces is especially impressive, for example, for rolling mill pinions and similar parts, which, because of their size, cannot possibly be heat treated by any conventional means. A marked increase in the adaptation and use of this general method for special heat treating jobs can be expected.

Stampings Are More Complicated

(*Continued from Page* 221)

this in turn presents a brighter outlook to the industry.

Mr. Stanitz notes that manufacturers again are making capital investments for tools and machinery to improve methods and products. As engineers are called in to redesign and restyle products, this working capital for tool and die expenditures and increased production are bringing about a return to stamping and formed shapes.

Several new developments were noted in the technical end of the industry. For example, two new types of presses are available. One is a double and triple action press featuring a welded steel frame. The other type of press has ram and blank holder operated by hydraulic cylinders.

Manufacturers of enameled sanitary ware, such as sinks, lavatories, bathtubs, etc., now draw these items from single sheets of steel and eliminate the need for welding. Drawing steels are of superior quality and it is now possible to reduce a round blank as much as 55 to 60 per cent in the first draw. The ever increasing demand upon steel manufacturers for steels to take difficult draws has resulted in these improved materials, concludes Mr. Stanitz.

The tendency in the automotive industry is to seek stampings and assemblies of less weight and of equal or greater strength, reports Gordon Stoner, vice president, Midland Steel Products Co., Cleveland. This has increased the amount of welding in assemblies and has resulted in more complicated and difficult stampings. These demands are leading to more and more interest in new types of steel or alloys which will give more strength with less weight. However, says Mr. Stoner, this demand is deterred somewhat by the extra cost which such metals involve.

R. L. Kenyon and T. F. Olt, research metallurgists, American Rolling Mill Co., Middletown, O., report considerable activity in the stainless steel field during the year, a part of which has been directed toward reduction of costs which would lead to an expansion of the market. New compositions also have been developed to provide austenitic types which could be stabilized against intergranular corrosion. Mechanical improvements have led to successful production of larger sheets with improved surface.

All of this has led to new applications and extension of old ones, Messrs. Kenyon and Olt point out.

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Among these may be mentioned use of 11 to 12 per cent chromium steels for railroad hopper cars and coal handling equipment, and the 17 per cent type for electric heating element covers, electric stoves and ranges, and inside annealing covers for annealing sheets and coils.

Notable progress has been made in the timed method of spot welding. Improvement of lubricants for deep drawing by increasing film strength, and thereby decreasing scoring has increased the utilization of stainless steel for deep drawing purposes.

In the field of low-carbon mild steel sheets, expansion of strip rolling practice has provided thin-gage, wide sheets of increased length. The improved drawing qualities of these sheets have been utilized to produce more difficult draws. Sheets for vitreous enameling are finding wider use for forming lavatories, sinks and bathtubs. A 2,000-ton press was built specially for this work.

Concluding, Messrs. Kenyon and Olt state that in forming automobile doors, use of a hold-down has been discontinued to save scrap on the edges and this has necessitated use of an extremely soft, combination forming and drawing sheet. On panel jobs, hold-down pressure has been increased. A considerable increase was noted during the year in the use of cold-rolled sheets in coils for deep drawing purposes.

Many changes in dies and methods of stamping during the past year tended toward the production of more complicated shapes and consequently required higher quality in steel than ever before, asserts E. L. Wetstein, vice president, Great Lakes Steel Corp., Detroit. We appear to be in a transitory period in which we can look forward to body designs that probably will tax the ability of quality mills to accomplish what the automobile industry has in mind for body parts, he adds.

Foremost among developments in the press building industry during 1935 was the effort to attain more sturdy construction and this was accomplished by redesigns and selection of materials which would give greater strength and rigidity to press members, such as the bed, crown, uprights, slide, etc. So comments E. S. Porter, E. W. Bliss Co., Toledo. Crankshafts, connection screws, tierods, etc., also were made of higher grade materials.

Many new designs were brought out and older designs so improved that machines that were only built occasionally are now becoming popular because they have demonstrated their ability to cut costs and increase production. High production presses which operate from 200 to 300 strokes per minute and even up to 600 or 700 strokes are becoming almost universal for certain classes of work produced in large quantities. Notable among new types of presses, according to Mr. Porter, is the triple-action drawing press, which is interesting because of its great size, and the four-point suspension press.

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Foundries Aim at High Quality

(*Continued from Page* 224)

the heat treatment of steel but in general devoting more attention to the control of a particular desired cooling rate, constitute something of a novelty among foundrymen. It is not at all impossible that the next demand will be for the adaptation of a controlled atmosphere to these furnaces.

"It is not without interest to note the revival of attention to the question of the 'quality' of pig iron as distinguished from its mere chemical composition. This question was discussed at some length by the American Institute of Mining and Metallurgical Engineers at the meeting held in connection with the National

Metal Congress in Chicago last October. It would seem that ultimately something of importance should result from such a study."

IN CONNECTION with the casting of camshafts and crankshafts, James T. MacKenzie, metallurgist, American Cast Iron Pipe Co., Birmingham, Ala., calls attention to a fundamental point of interest in the analysis of these materials—the use of copper—which has not heretofore taken any prominent role in cast iron metallurgy. It appears, he says, both from these applications and from the use of the element in Zee metal and other high-strength malleables, that copper is probably slated to replace nickel to a certain extent in a considerable number of castings where its corrosion resistant ability, especially acid and atmospheric corrosion, also can be a factor.

Mr. MacKenzie observes that the United States Pipe & Foundry Co. has brought out an interesting development in the cast iron roof, instances being cited of cast iron roofs in China which are over 500 years old and show practically no sign of deterioration.

Apply Known Science

The year has been characterized more by systematic gradual developments and the further practical applications of known science than by radical innovations, comments J. W. Bolton, metallurgist, the Lunkenheimer Co., Cincinnati. As illustrative of gradual development through careful probing are the many subjects being discussed currently in foundry technology. As illustrative of more extended practical application of known science are the increasing volume of iron castings being heat treated, and the widening use of age hardened alloys.

Extended use of electric furnace iron has allowed a more exact analysis in the product, declares R. S. MacPherran, chemist and metallurgist, Allis-Chalmers Mfg. Co., Milwaukee, who further states that the percentages of alloys are increasing. More foundries every year are making iron of 60,000 pounds per square inch tensile strength. More exact pattern equipment is lessening the stock used on automotive castings, and foundry processes in general are under closer control. Looking ahead, Mr. MacPherran foresees an increase in the welding of cast iron.

Increasing favor of the automotive brake drums with centrifugally fused cast iron face is attested by the fact that this year the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., will produce between 2,000,000 and 3,000,000 of them, according to F. B. Whitlock, sales manager of the company. This company is also producing large quantities of electric furnace molybdenum-nickel-chrome alloy iron camshafts, sold under the trade name Proferall, as well as centrifugally cast wet and dry cylinder sleeves poured from electric furnace alloy iron, and diesel engine crankshafts of Proferall 3X cold melt electric furnace metal, highly alloyed.

USE of alloys has spread to the cast iron field in a notable way, observes W. J. Priestley, vice president, Electro Metallurgical Co., New York. Improved metallurgical control has produced better iron castings and by the use of alloys, more foundrymen are now offering special irons with greater strength, resistance to growth, wear and oxidation.

A. C. Denison, president, Fulton Foundry & Machine Co. Inc., Cleveland, is impressed with the advance made in applications of heat treated high-strength cast iron. He comments: "By heat treating we mean heating to temperatures above the critical, quenching in oil or some other solution, then reheating to the proper temperature to relieve the quenching stress and give the desired physical properties.

"During the year this heat treat-

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ment has been applied to dies for forming and drawing metal, small gears for machine applications, rolls under 1000 pounds weight, cams, liners and machine parts. The extent to which this development has progressed can be emphasized by the fact that for the past year our foundry has averaged over 15 tons of heat treated castings produced every month."

TURNING to the nonferrous foundry field, the comment of N. K. B. Patch, secretary, Lumen Bearing Co., Buffalo, is: "If there is any one outstanding feature in the nonferrous foundry industry during the last twelve months, in my opinion it is the growing appreciation of scientifically controlled manufacture of nonferrous castings and their heat treatment where such is desirable. I think this is traceable in some degree to the contacts made under the organizations brought about by the NIRA. Men who never have felt that chemical control or temperature control was anything but sales bunk found that their competitors were using them effectively and were developing their use to applied research, thus improving products and gaining increased recognition from consumers."

H. M. St. John, chief metallurgist, Detroit Lubricator Co., Detroit, states that "while the brass foundry industry has benefited from the general improvement in business, there is little to report in the way of technical progress or engineering development. There has been perhaps an increased interest in investigations which have for their object the production of a higher quality of castings, with less scrap and at decreased costs. There seems also to be a renewed interest in methods of sand control.

"The pressure casting of brass in steel molds continues to make slow but steady progress, utilizing machines of the Polak and Buehler types. Up to the present, brass foundrymen have been inclined to oppose and belittle this development, but it probably offers them their most favorable opportunity to compete against the encroachments of forged brass and zinc-base die castings."

Improve Bearing Metals

Development of several new types of nonferrous bearing metals is discussed by Sam Tour, vice president, Lucius Pitkin Inc., New York. One type of alloy is of a cadmium base containing either a small amount of nickel or a small amount of silver as the main alloying ingredient. Thousands of automotive engines are now regularly equipped with this type of bearing. The past year has seen a considerable application of calcium-hardened lead in lined bearings for high-pressure slow-speed applications, notes Mr. Tour. High-leaded copper alloy is being used extensively for bearings, one automobile manufacturer now using a steel-backed bearing of this type widely. Mr. Tour says the need still exists for a better nonferrous material for use as a bearing metal at high temperatures.

Progress has been made in development of nonferrous castings with high thermal and/or high electrical conductivity. The need has been for castings combining high conductivity with hardness and efforts are being made currently to meet this particular demand.

Reviewing progress made in foundry equipment, F. R. Wallace, president, Tabor Mfg. Co., Philadelphia, also president of the Foundry Equipment Manufacturers' association, observes: "The past year has seen a wider application of ideas which were developed during the depression. These ideas, have, in the main, tended toward increasing speed of operation, expediting handling of materials or improving the operating functions of foundry equipment previously manufactured.

"Probable exceptions to this will be found in the wider acceptance of newer methods in cleaning equipment, notably the airless types and

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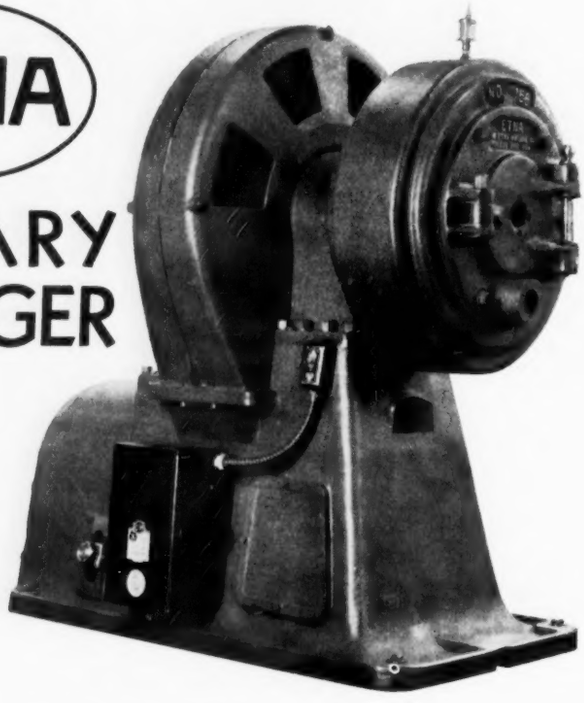
ROTARY SWAGER



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the low-pressure large-volume abrasive cleaning equipment. Similarly, there has been an acceptance of two outstanding types of dust collector apparatus which utilize water to entrap the dust from the collector.

"In the field of improvement of working conditions, foundry plants have given more attention to heating and ventilating, to the removal of dust and fumes, many having installed vacuum cleaning or washing systems. In one instance, a new foundry has been completely air conditioned."

Die Castings Increase in Size

(*Continued from Page 224*)

Tour, with difficulties in obtaining satisfactory machines at reasonable prices retarding the development. Those companies which are commercially producing brass castings still find their main difficulty in the life of dies. New steels are being tried out to find one which is outstanding.

The spectacular feat performed last year was the tooling up and going into production of automobile radiator grilles for some 22 models by three commercial die casters, asserts R. L. Davis, market development division, New Jersey Zinc Co., New York. At the other end of the scale, production speeds have been upped greatly for small castings.

Speeds of 1000 to 1200 shots an hour have been achieved on small parts in one plant. Furthermore, the elements of a zipper-type slide fastener are cast onto the cloth tape at a speed of 4200 per hour. The designer of this casting machine claims other small parts, comparable in size to many screw machine parts, can be cast on the machine, and experimental dies for such parts have been made.

Heavier Plates Adopted

In the finishing field, Mr. Davis points out there has been a more definite stand taken toward recognizing the importance of greater thicknesses of plated coatings to withstand exposures. Only a few years ago, difficulty was experienced in getting specifications of a minimum of 0.00032-inch; now most automobile manufacturers specify a multiple plating of around 0.001-inch. Obviously, this will result in definitely improved service.

Manufacturers of inorganic finishes have produced new lacquers and enamels with improved properties. The greatest improvement in this field, however, concludes Mr. Davis, has been further development and use of pretreatments which make a slight etch on the die cast surface and deposit slight amounts of various metallic salts. These treatments result in greatly improved adherence of enamel coatings.

Further development of large die castings also proves impressive to Charles Pack, Doehler Die Casting Co., Toledo, O. Until recently, the die casting process had been looked upon as a method for producing small and intricate castings, but today it has found its place for making large and heavy castings. The best illustration of this is the use of the process for making automobile grilles which weigh anywhere from 12 to 23 pounds and range in length from 30 to 36 inches.

In addition to these grilles, various other large castings are now being used in automotive practice; one car maker employes a die cast instrument panel. This casting is approximately 44 inches long, and according to Mr. Pack, shows an appreciable saving in assembly costs. There is no doubt but that still larger castings will be produced by the process in the future.

The tonnage of brass pressure die castings made in 1935 increased approximately 35 per cent over 1934, reports W. W. Sieg, metallurgist,

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Titan Metal Mfg. Co., Bellefonte, Pa. Growing interest is noted in this method of manufacture as short cuts are being found to make the production of parts more economical. Introduction of hydraulic core pullers has aided considerably in the production of cored parts.

Little progress has been shown in the die steel problem during the year, continues Mr. Sieg, who emphasizes that alloy steel makers could assist the industry vastly by developing a more suitable steel to resist the heat encountered in pressure casting brass. At present, production is dependent entirely upon die life, therefore, many parts which normally would make good die castings cannot be made profitably by the process because of the initial and subsequent upkeep costs of dies. There is every indication, Mr. Sieg states, that manufacturers of brass pressure castings are willing to co-operate with each other and with steel companies in the solution of this vital die steel problem.

DURING 1935, dollar volume of aluminum die castings showed a marked increase, statistics by the American Die Casting institute reflecting a 50 per cent gain for the first ten months of 1935, as compared with the corresponding period of 1934. So reports E. H. Dix Jr., chief metallurgist, aluminum research laboratories, Aluminum Co. of America, New Kensington, Pa., who accounts for a good deal of this increase by the greater use of outdoor aluminum die cast meter cases and adoption of the aluminum die cast wringer frame by several washing machine manufacturers.

Little that is new has occurred in die casting technique, continues Mr. Dix, except that larger and larger aluminum die castings are being made—castings weighing upward of 20 pounds have been produced. The corrosion-resistant, high-purity aluminum-silicon alloys, mentioned last year, are being further studied by the A.S.T.M., and have been successfully used in a few small applications. A new alloy containing about 5 per cent nickel, and having a melting point appreciably higher than alloys hereto employed, has been developed to meet the requirements of die cast gas burner heads for certain specific conditions.

Output Speeds Boosted

One qualified observer of the die castings industry calls attention to the continued increase in speed of production, especially in connection with small and medium-size castings. Rates up to 1000 shots an hour have been maintained in at least one case, and, as multiple-cavity dies are used in many jobs turned out by this machine, the number of castings produced per hour is 1000 times the number of cavities. This applies to castings weighing from a fraction of an ounce up to several ounces. With slightly lower speeds, this same method can be extended to some castings weighing a pound or more.

Continuing, this observer states that one complex small part with several cores in different planes is now being run on this machine in a two-cavity die. These zinc alloy castings weigh about 0.05-ounce and are used in a well-known make of low-priced watch. The increased use of large die castings for radiator grilles is also cited as an important development of the year. Castings of equal or larger size were made before, but to obtain such castings in thin sections and with surfaces smooth enough to take a polished plating without undue labor in polishing was a real accomplishment.

D. L. Colwell, Stewart Die Casting Corp., Chicago, likewise calls attention to the trend during the year toward larger and more important zinc-base die castings. Probably the castings which caused the greatest comment were the radiator grilles and gear cases for washing machines. In the former instance, assembly of the die cast grille was so much simpler that, even though the grille itself was more expensive,

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overall cost of the automobile was less. In the latter instance, machining operations omitted made the die cast case more economical than the material previously used.

There has been some use of the molded plastics in finishing die cast hardware, Mr. Colwell reveals. The die casting is used as an insert for strength and low cost and the finish is obtained by molding a plastic around the die cast insert. Thus a wide variety of finishes and colors can be provided.

Finishing Methods Are Improved

(*Continued from Page 226*)

Entirely new products have been obtained which have remarkable properties both from the emulsifying and penetrating angles and also from the stainpoint of adhesion and slip which, concludes Mr. Mitchell, are so important in metal drawing or stamping operations where often the pressures are high.

The procelain enamel industry has been helped by some new developments during the year. The trend toward one cover coat of enamel has progressed and one cover coats in white now are being obtained. A new type of porcelain enamel process said to develop great depth of color in two coatings and firings was announced. Another development was a new porcelain enamel for cast iron. A new acid resisting frit was announced.

In the field of hot dip galvanizing, says Miss D. R. Pearlman, Enterprise Galvanizing Co., Philadelphia, one of the most important developments in recent years in improving both quality and appearance has been the installation of automatic temperature controls on oil or gas fired kettles. Prompt regulation of the temperature to the desired temperature, which depends on the construction of the item, the kind of material from which it has been fabricated and the tonnage to be run, insures a proper bond and a smooth coating of uniform thickness.

Improved Galvanizing Practice

Continued use of non-acid flux washes, says W. H. Spowers Jr., New York, has proved advantageous in the production of superior galvanizing with definite economies in operation. Recent development of a transparent liquid which will lie on the top of the molten zinc at the galvanizing temperatures and prevent the formation of zinc skimmings or zinc ash, not only effects savings by eliminating this residuum but improves the appearance and quality of the work.

Perfection of a new type of wiping material for use in woven fabrics has proved to have great advantage over the usual damp charcoal technique, says Mr. Spowers. Probably one of the most interesting developments, he concludes, is the efficient new method of deep, side firing. This system, he says, now embraces many installations which last four to seven years where the requirements are of a high production character.

Two phases of pickling have been getting more than the usual attention, says Wallace G. Imhoff, Wallace G. Imhoff Co., Vineland, N. J. Agitation now on foot to stop pollution of rivers by dumping waste pickle liquors into them has started active investigation as to the best way to handle these waste liquors. The subject of fumes also has come up actively so that ventilation and air conditioning of galvanizing departments are being studied.

Galvanizing Furnaces Improved

Corrosion after pickling has been found to be one of the main causes of dross production, says Mr. Imhoff. He also points out that a number of new and decided improvements have been made in galvanizing furnace design and construction both for oil and coke fuels. He sees in the patent, No. 1,974,610, granted to Percy

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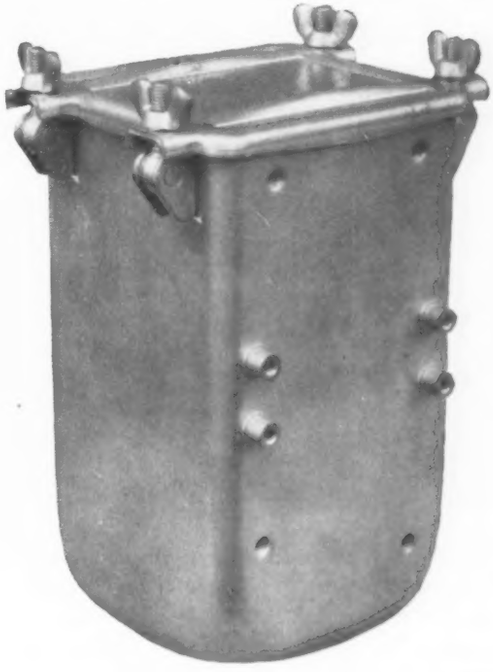

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Gray, Jefferson, Iowa, a radical departure from ordinary galvanizing pot construction. Among interesting developments, he says, is the fact that a zinc coating which will stand 12 dips by the Preece test now is offered for chain-link fence.

Progress in Metallic Coatings

Galvanized products today are far superior to those of 10 or 15 years ago and there is every indication that in another year or so the present standards again will be exceeded, says Dr. Colin G. Fink, head of the division of electrochemistry, Columbia university, New York. The galvanizing industry is fully reconciled to the fact, he declares, that electrogalvanizing is as good as and frequently superior to hot galvanizing. There has been a tendency to get away from a pure zinc coat and resort to zinc alloy coats, better than the old zinc in mechanical and chemical qualities.

Investigations have been carried on in Europe and America on improvements in the production of tin plate, he continues. Tin as a metal, he says, has many outstanding advantages over other metals. Renewed interest has been shown in lead coated steel and improved methods have been developed for applying the lead so as to obtain perfect adhesion and uniform distribution. Copper clad steel has entered wider, newer fields. Nickel clad steel is finding fresh outlets daily. A relative newcomer is aluminum coated steel.

Some plastics have been found which are highly flexible, attractive in appearance and which adhere tenaciously to steel, says Dr. Fink. In a number of cases a steel article with a thin coat of plastic readily takes the place of enameled ware. A development with future possibilities is the application of thin coats of powdered metal to the surface of iron or steel and subsequently consolidated into a continuous film by pressure and heat.

Due to scientific control it now is possible to deposit metals and alloys not heretofore feasible, says Dr. C. B. F. Young, technical director, United States Research Corp., Long Island City, N. Y., and director of research, Biolite Corp., New York. A good example is the deposition of zinc-cadmium alloy by a large electrical company; the same is true of chromium. In order to obtain a good deposit of this metal it is necessary to control the sulphate-chromic acid ratio, which is accomplished by making periodic analyses. Research still is needed on the deposition of aluminum, molybdenum, beryllium, ruthenium, osmium, zirconium and thorium.

Dipping in Aluminum

Research at present is endeavoring to establish ways and means of obtaining specified finishes, continues Dr. Young. While the large companies are seeing the light, most small companies still have no idea of the amount of metal which is deposited on an article. But progress is being made in helping operators to secure more ductile, non-peeling deposits in quicker time.

Plating aluminum from aqueous solutions so far is impossible commercially, says Dr. Young, but this condition seems to have been overcome to some extent. The steel articles are covered with a thin layer of aluminum by hot dipping, exercising care to have a reducing atmosphere around the articles during the coating process. Another gratifying result of research work during 1935, he points out, is the development of many new synthetic cleaners which are of great value in surface treatment and finishing of metals.

In the spraying of molten metal, says L. E. Kunkler, president, Metallizing Co. of America Inc., Los Angeles, greater progress has been made in the past year than in the previous 20 years. The oil industry largely has adopted metal spraying for the surface treatment of refinery vessels to protect them against the attacks of hydrogen sulphide. Zinc spraying is being employed extensively for protecting bridges, pole

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line hardware, the inside of large water tanks and other structures and parts subjected to corrosive attacks. A number of nationally known manufacturers employ metal spraying for the improvement of their products. Many machine shops have adopted this process for applying high carbon steel and stainless steel on worn shafting. Great headway has been made in the application of sprayed babbitt metal in place of the customary poured babbitt metal.

HARD facing has made great progress during 1935, says R. K. Kennedy, Haynes Stellite Co., New York. A new hard-facing welding rod meets the demand for an inexpensive rod for hard-surfacing parts on which roughness of surface contour is permissible but where extreme abrasion resistance is required. The new rod is of hollow steel filled with crushed and screened tungsten carbide particles. A number of production lines making aircraft valves, automotive and aircraft valve seat inserts, and steam valves and plugs, now include hard facing as a regular step in the manufacturing process.

F. H. Bailey, Hauser-Stander Tank Co., Cincinnati, reports that the new and important advances in pickling tank construction are reflected in lining materials, embracing rubber in various forms, lead, mastics, acid proof brick and masonry compounds, stone and other materials. The chief reason for the swing to such materials as linings is the trend toward continuous pickling in long tanks and the use of stronger and hotter acid solutions which not only speed up the pickling operation but which pickle the newer alloy steels efficiently.

Other Metallic Finishes

An interesting development in 1935 was the development of a new chemical process for reducing copper to fine, non-crystalline particles suitable for use in a liquid vehicle. This "liquid copper", it is stated, may be applied over metals in solid coatings devoid of any minute gaps. Another beneficial development is a new stop-off lacquer for use in chromium plating. Still another is the use of palladium leaf, a newly available material, for decorating weather vanes and similar objects with a platinum white finish, thus supplementing gold leaf in such applications.

The automotive industry again made marked forward strides during 1935 in its finishing methods. Most of the large automobile plants, as well as many branch assembly plants throughout the country, according to Binks Mfg. Co., Chicago, have installed complete paint circulating systems. In addition to increasing efficiency and reducing costs, these systems result in cleaner finishing departments and more uniform finishes.

Profits from Right Power Drive

(*Continued from Page 234*)

now available which the manufacturers state will require not more than one take-up after installation. Corresponding strides have been made in special tannages for improved friction surfaces or meeting severe operating conditions.

Quality of Belts Improved

Equipment for vulcanizing rubber belts endless on the pulleys, new types of rubber belts, fabric belts, high-speed belts, oil resisting V-belts, and others are now available. The introduction and wide adoption of the pivoted motor base on short-center drives for maintaining tension under fluctuating load requirements has been an advanced step in making short-center belt drives more satis-

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factory under severe conditions. Particularly are these pivoted bases, V-belts, and chains being used on lineshaft drives to reduce loss in speed between the prime mover and shaft as well as to provide a compact unit.

Proper Application of Lubricants

Likewise lubricants, together with methods and equipment for their application, have undergone many improvements. Now a plant may specify 20 to 30 types of lubricant each for use in a special narrow range of service conditions whereas only a few years ago ten or so types were expected to serve. Particular attention has been directed toward improved lubricants for anti-friction bearings and gears, especially on the so-called extreme-pressure lubricants where the addition of various materials tends toward the prevention of the film rupture under high pressure.

The most noteworthy feature in lubrication is greater appreciation of the necessity of proper application. Manufacturers of metalworking machines are generally building automatic force-feed or pressure lubrication systems in the machine. Many plants are entirely reconditioning equipment by installing modernized lubrication equipment and transferring its supervision from the machine operator to departments responsible for maintenance or machine repair.

CONSIDERATION of bearings is almost inseparable from their lubrication, as, for example, the improvement in the seals and design of antifriction and other bearings to retain lubricant and exclude dirt. The better appreciation of the importance of the proper lubricant and the correct method of its application have done much toward the reduction of bearing maintenance. Also, there is a growing appreciation that special alloys, better design, and more accurate machining of plain bearings, particularly the grooving, remove the more common objections to this type.

Speed reducer users are inquiring more generally into the special suitability of the different types of units for any particular requirement or operating conditions. Efficiency is also receiving greater attention because cheaper units of low efficiency require a higher initial investment in motor and also more power. Gears of special heat treated alloys are becoming more commonly used for the more severe services. Machine designers are recognizing more generally the advantages of speed reducers, either motorized or alone or in combination with variable speed transmission units, over gear sets on both standard and special equipment.

IMPROVED variable speed transmission units of various types, including hydraulic, are now being built into many machine tools, thus acknowledging the importance of variable speed control. Similarly automatic control is supplanting manual control to a large extent where practicable. Motorized units, with or without built-in speed reducers, are providing especially compact equipment for standard or special applications. Announcements of variable-pitch V-belt sheaves and of variable-pitch pulleys which provide speed adjustments within a limited range, should extend the advantages of variable speed into many additional applications.

Clutches, which must bear the most severe operating conditions of any piece of transmission equipment, have been improved or redesigned by several manufacturers to meet the shock loads and high speeds of operation.

Manufacturers of motors and controls have also recognized the growing specialization in the drives and control of the larger specially designed metalworking and processing machines, and have in some cases designed practically individual types

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of motor and control equipment. However, for the ordinary drive and control for lineshafts and individual motors on the general types of machine tools the use of standard motors still has many advantages, not the least of which is the ease of repair and replacement in case of emergency. The previously mentioned tendency toward building motors, speed reducers and variable speed transmissions into single units for compact installation probably will have still wider applications.

These are only a few of the many improvements in equipment available to the plant executive interested in obtaining trouble-free operation. However, even with better equipment, it is just as necessary that it be selected for the operating conditions, not overloaded, properly serviced and, above all, that consideration be given to its suitability to production requirements and cost of operation.

1935—Big Year in Machine Tools

(*Continued from Page 232*)

statement that great strides have been made in the choice of material for the various parts and he feels that the machine tool builders in general have taken full advantage of the recent developments in alloy steels, materials for castings, etc. It is interesting to note also, he says, the wide-spread use of antifriction bearings for spindle as well as other applications, and it is safe to say that the speed, rigidity and accuracy possible with modern machine tools is largely due to the greatly improved bearing applications.

Control devices have been extensively improved by using the latest development in hydraulic and electrical engineering, Mr. Bergstrom continues. The improvement in control equipment has reduced loss of time and increased the efficiency of the modern machine tools to a maximum. During the recent machine tool show it was interesting to note the ease with which the heaviest machines could be handled.

New Machining Methods

Automatic machines of the most ingenious designs, he notes, have been perfected to a degree which only a few years ago would have seemed impossible. Broaching and diamond boring offer the user new methods which are rapidly gaining in use in all branches of industry.

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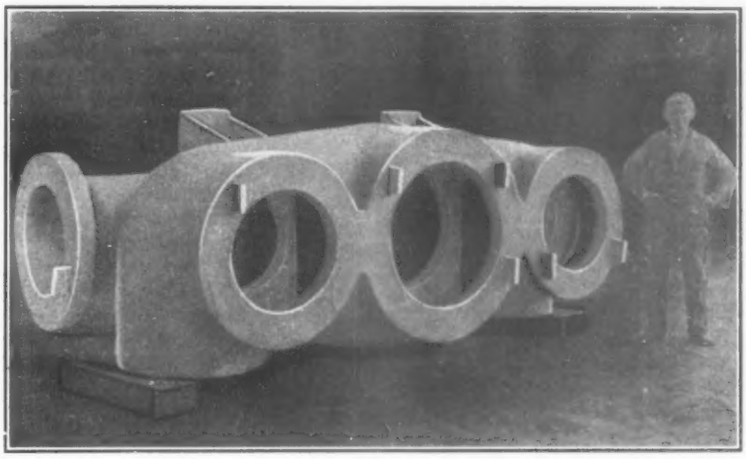

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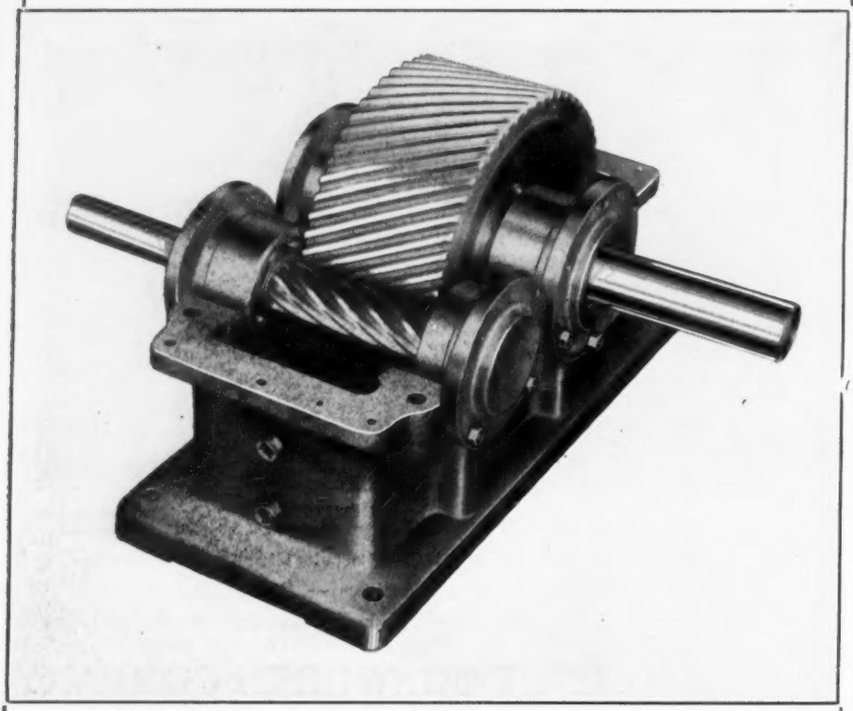

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guards protect vital parts against dirt, grit and chips. Cutting materials such as cemented carbides and others are continuously being improved and are finding an ever increasing use, Mr. Bergstrom relates.

The accuracy obtainable with modern machine tools has forced the design and construction of greatly improved gaging and checking equipment and the builders of such equipment have met the most exacting demands. During the last few months Mr. Bergstrom had the opportunity to visit a number of the leading machinery builders' plants and found gratifying the effort and time which is being spent on new ideas and experiments which undoubtedly will result in machine tools of still greater efficiency.

OFFERINGS of the machine tool industry as viewed in the light of the 1935 exposition by W. W. Gumprich, manufacturing engineer, International Business Machines Corp., New York, as well as through contact with various producers over last year, reveal the following trends:

A great increase in hydraulic drives over mechanical, where applicable.

More precise, rugged and rigid structures to permit the stresses of greater work output.

A concerted effort toward ease of function and control of machine tools to eliminate as much of the non-productive time as possible during a work cycle.

A retrogression from the single-purpose machine trend, in evidence before the depression, to a construction of the wider variation of utility. In its place arose a much more pronounced division in machine tools for out and out manufacturing purposes and such of all around utility.

Speeds and feeds, particularly toward the latter part of the year, showed a considerable increase toward the higher ranges, with the necessary change in constructive details to smooth the action of the driving mechanism required in the use of the carbide class of tools.

THE greatest progress of any machine tool class has probably been made in the application of broaching processes. This progress has almost amounted to a "jump" forward rather than a slow procedure.

Hand in hand with the revival of the progress in machine tools has gone a beneficial forward march in the availability of better materials. Alloys steels have appeared on the market, such as chrome-molybdenum steels, that permit machining at extremely satisfactory speeds, in the heat treated state, eliminating use of old materials that required heat

treatment with the inevitable aftermath of subsequent straightening, grinding and other re-working operations that are so costly. More uniform and reliable steel products, in all marketable shapes, seem to have been available, that in a considerable number of cases avoided the necessity of buying over-size stock, and that as a general rule was by far more satisfactory from the standpoint of uniformity.

Trends as seen by Mr. Gumprich seem to point in the following directions:

Final satisfactory solution of the carbide tool problem that will permit the use of the various cemented carbide mixtures with their subsequent higher speeds and feeds with the same freedom from fear of breakage as is at present experienced with high speed steel tools. This will result in a considerably greater market for these products and, therefore, bring with it a badly needed reduction in initial cost of equipment.

Expects Further Improvements

He believes that the machine tool industry in the next few years will make still greater strides forward in designing machines capable of higher productive output than has been done in the last few years. Broaching will surely find a by far greater application than it has in the past.

More development probably will be made in the availability of free-cutting steels and in the development of free-cutting alloy steels, particularly of the stainless type. The stainless material, particularly, should find a greater and greater use in the machine industry after some of its deficiencies are overcome and the price will have been lowered. Resistance to corrosion is a highly desirable factor in making machine parts as evidenced by the free use of plating finishes, Mr. Gumprich concludes.

To the casual observer improved appearance of modern machine tools is the most evident development, in the opinion of H. S. Johnson, Gisholt Machine Co., Madison, Wis. The housing or building-in of electrical equipment, the elimination of numerous projecting housings, and the use of modernistic lines has greatly improved machine appearance. With the redesign of machine tools for appearance, there has also been a considerable increase in the rigidity of the machine to eliminate chatter and thereby give a better finish on the work.

Closer study of the machine tool will convince one, he says, that a considerable amount of effort has been put forth to make the machine easy to operate with hand operations replaced where possible by automatic or powered-operated means for

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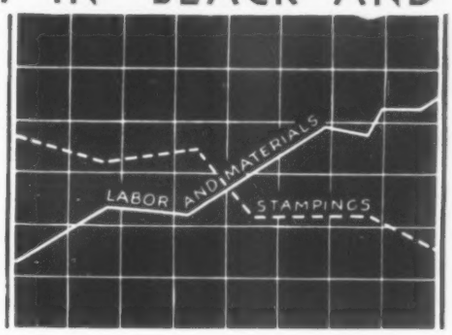

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indexing and clamping and for traversing the tools to cutting position. Control levers have been placed in convenient positions and the number of levers has been decreased by the use of dial controls and by making one lever serve several functions. Also, to make for easier and faster operation, levers have been duplicated so that the operator may control the machine from each of several possible operating positions. The machine controls have now been concentrated and positioned so that the operator has all speeds and feeds available from the normal operating position.

The present trend of machine tool design, Mr. Johnson asserts, also shows that the designers are making a sharper definition of proper applications for mechanical, hydraulic and electrical devices. Where a few years ago it seemed reasonable that hydraulic and electrical devices might largely supersede mechanical devices, it is now evident that mechanical devices have a definite place in the machine tool, he contends. This by no means is an indication that hydraulic and electrical devices will not be used because the fact is that they are finding more and more applications. These applications, however, are along reasonably well-defined lines.

More Interchangeable Units

The trend of machine design also shows an increased use of interchangeable units applied to automatic and semiautomatic machinery. Use of the interchangeable unit is in many cases eliminating the use of complicated miltiple-operation machinery which can only be changed over to new operations with great difficulty. The semiautomatic single-purpose machine using interchangeable units is taking the place of the more complicated multiple operation automatic, he declares. The interchangeable unit is even being applied to many lines of hand-operated machines and this development undoubtedly will continue because it is economically sound.

Use of antifriction bearings is increasing and undoubtedly will continue to find even more applications. With the use of higher speeds and loads, there is a definite trend toward improved systems of lubrication. The cascade system, designed and built into the machine tool, is becoming more and more popular. These high speeds, of course, are made necessary by the increased use of high-speed cutting materials. Consequently, multiple tooling is finding greater and more effective employment, because it now is possible to have several cutting tools all operating on a given piece of work at their most efficient cutting speed and feed.

Twenty-five years ago, says H. C. Pierle, secretary and sales manager, R. K. LeBlond Machine Tool Co., Cincinnati, many of the machines shown at the 1935 exposition would not have been possible, as engineers did not have available to incorporate in their designs such refinements as antifriction bearings, alloy steels, hydraulic mechanisms for feeds and speeds, unit lubricators for lubricating the entire machine, and electrical equipment and controls.

As the foregoing features were tried and proved they were incorporated in designs. There was no overnight development, but a steady progress to meet the demands of industry. This progress in specialization of machine tools has enabled the purchaser to reduce costs and be of great benefit to the user; but unfortunately it has reduced the machine tool builders shop to more of a laboratory than a manufacturing plant, and does not permit him to use methods that he develops for his customers and derive the financial benefits therefrom, Mr. Pierle declares.

MARKED extension in use of hydraulic feeds; refinement and simplification of controls; increased rigidity of machines and tool holders; extended use of chilled and hardened ways, also protective covers for ways; improved technique in servicing carbide tools; more power applied to working spindles—these features impress W. K. Creson, chief engineer, Ross Gear & Tool Co., Lafayette, Ind., as particularly important. He believes that developments of the last six years are, to put it mildly, astounding. Machine tool builders have done more to stimulate their business by these advanced designs than could have been accomplished by any other method, regardless of cost.

Summing up the progress that has been made, it would seem that machine tool builders have directed improvements along three distinct lines in order to increase productivity, attain a greater degree of precision, and to provide controls that effect easier and safer operation.

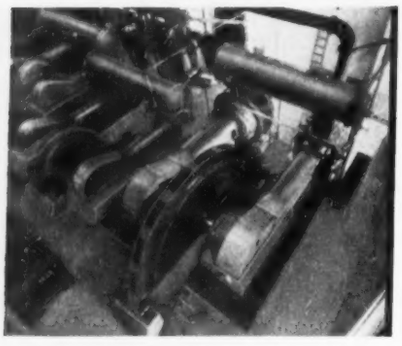
Tolerances Are Closer

The advance in productivity, particularly of the manufacturing units, is striking indeed. Rigidity as well as cutting capacity has been increased, in addition to more rapid slide movements. Speed and feed of cutting tools have in many cases been doubled or tripled, while multiple-spindle machines or multiple work-holding devices are incorporated in many machines that formerly had only one spindle and one work-holding device. The result is increased hourly output.

A striking example of the high degree of precision with which work pieces are machined today is found in a new centerless lapping machine on which piston pins of $\frac{7}{8}$-inch diameter and $2\frac{1}{2}$ inches in length are finished to a tolerance in diameter of one-half of 0.0001-inch, to a straightness of one-half of 0.0001-inch, and to a tolerance in roundness of one-fourth of 0.0001-inch. Similarly, the tolerances produced in other types of machines have been considerably tightened.

Over the past year there has been a marked increase in the use of hydraulics for feeding of machine tool slides, a trend that no doubt will become even more prominent in design. Electrical and hydraulic de-

STATIONARY
AIR OR GAS
COMPRESSORS



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vices are responsible for some of the improvements in control. Mechanical and pneumatic devices employed reveal the application of ingenious constructions that enhance the ease with which the machine may be operated and which substitutes automatic for manual methods. The more general use of tungsten carbide tools has required redesign in feed and speed mechanisms, and with this change an increase in power has gone hand in hand. Considerable headway also has been made in gear shifting mechanisms for speed and feed changing devices.

More Variable Speed Drives

Use of snap rings on ball bearings of all types to provide axial location, simplify machining and facilitate mounting in machines is cited by J. H. Baninger, assistant chief engineer, New Departure Mfg. Co., Bristol, Conn. The use of integral flanges on ultra-precision spindle bearings for the same purpose also is impressive. Ball bearings of the angular contact double-row type for sheaves and pulleys are now made with integral seals on both sides, he points out.

Mr. Baninger brings attention to the decided trend toward the application of variable-speed drives by which machine tools may be operated at feeds and speeds best suited to different diameters of work, various kinds of cutting tools and different types of materials.

Motor drive applications are becoming almost universal, accordng to H. J. Griffing, sales research engineer, Norton Co., Worcester, Mass. He asserts that the trend is toward greater flexibility in machine tool design, this being accomplished by employing construction that permits a machine base with various of its common units to be supplied either as a single-purpose machine or a general purpose machine. Even semiautomatic or full automatic machines can be assembled in this way. It also has become necessary to build many types of machines so that they can be equipped with mechanically or hydraulically-operated interchangeable mechanisms and units.

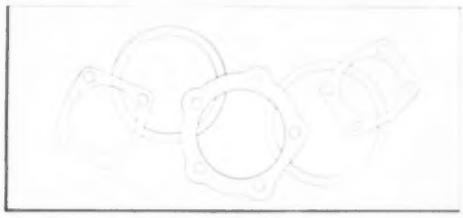
Refractories Fit Needs of Times

(*Continued from Page 237*)

quirements involved in any given application is seen by R. R. La Pelle, industrial heating section, power engineering, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. He notes that a number of new types of semi-insulating, semirefractory brick have been placed on the market, and are designed not so much to improve the qualities already obtained in bricks of this character as to provide a number of grades of refractories, each of which represents the least expensive possible combination for some certain set of conditions.

There has been considerable work done in the semirefractory field, Mr. La Pelle observes, toward the development of refractories which will better withstand the action of reducing gases which tend to disintegrate or crumble ordinary materials. Much still remains to be done on this score, however, he believes, since for most severe applications refractories still have a rather limited life, failure coming not through temperature action but through disintegration due to hydrocarbon and hydrogen atmospheres.

G A. BOLE, research professor, engineering experiment station, Ohio State university, Columbus, O., considers significant the fact that the American Society for Testing Materials has formed a subcommittee to study specifications and methods of test other than insulating value for insulating refractories—the lack of



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which has been felt keenly by some purchasers of these materials.

Prof. Bole reports that his organization is carrying out research at present on new methods of manufacture, using gels as the setting-up agent in the manufacture of insulation, a development which will add to refractoriness and lower costs.

Cold set bonds for refractories, he declares, are coming to be more widely accepted each year. If these products perform as well as the fired materials, a decided economy results for the user.

Builders of rotary furnaces for foundries have been confronted with the need for finding refractories which stand up more satisfactorily than does ordinary fireclay, notes H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland.

S. M. Jenkins, insulating division, Armstrong Cork Products Corp., New York, calls attention to the fact that insulating firebrick are being used in large quantities by the steel industry, especially for lining of annealing covers, bell-type furnaces, annealing furnaces, and the like. He observes that steel plant engineers are designing their furnace equipment along the line of thinner walls, made possible by the use of insulating firebrick, with resultant increased efficiency.

One of the fundamental effects of complete furnace insulation which leads to longer furnace life is the reduction of the temperature gradient through the refractory cross section, according to A. S. Nichols, sales manager, Illinois Clay Products Co., Joliet, Ill., and this principle, as it affects important crystalline changes in the structure of the refractory, is being applied to advantage in numerous types of furnaces.

Blast furnace operators are considering the removal of disintegration occurrence from portions of stack linings by means of properly applied insulation, and users of light weight refractories find that disintegration and spalling tendencies found in this type of brick are reduced by backing up with brick possessing maximum insulation value, states Mr. Nichols.

R. Kirkpatrick, assistant sales manager, abrasive division, Norton Co., Worcester, Mass., finds that users of refractories are becoming more and more conscious of the qualities of so-called super-refractories, and tend to give detailed attention to the quality of refractory materials as determined by the chemical and physical properties. In other words, he believes, users are becoming more and more scientifically critical of refractory materials—a tre[illegible]ich, in the long run, can prove be[illegible]eficial to both producer and u[illegible]

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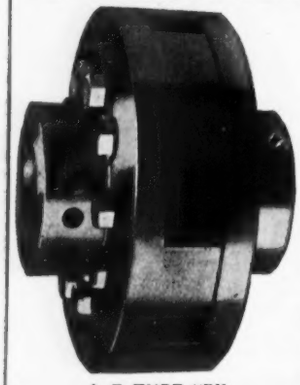

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More Open Hearths Insulated

(*Continued from Page 240*)

sacrificing the need for slight softening at pouring temperatures in order to maintain a proper seat for the stopper. Mr. Hewitt directed attention to the fact that magnesite stoppers now are available for the pouring for the special types of steel wherein the absence of inclusions outweighs the increased costs involved.

During the past year, advises Gilbert Soler, manager of research, Timken Steel & Tube Co., Canton, O., increased use of automatic control devices to regulate combustion and operating conditions of open-hearth furnaces has had a decided effect upon factors governing refractory life. Lowered velocities of outgoing gases due to changes in furnace design and the effect of controlled operation have resulted in greater refractory life of roofs, backwalls, endwalls, slag pockets and checkers. The factors governing re-

fractory life being changed, he asserts, different refractories may be used to obtain the best service economically.

All open-hearth furnaces of the Timken plant, Mr. Soler points out, have been insulated with a consequent saving in fuel, operating time and refractory costs. The effect of automatic draft control on refractories, he points out, has been to increase the life of backwalls and endwall bulkheads.

Operating executives and engineers continue to regard complete open-hearth insulation as one of the most important improvements in steel manufacture in recent years, states A. S. Nichols, sales manager, Illinois Clay Products Co., Joliet, Ill. The number of shops to adopt the policy of completely insulating every furnace is increasing steadily. Where refractories and furnace design have kept pace, he continues, the results in several instances are startling. One 120-ton furnace in the Chicago district has just completed a record campaign of over 500 heats without a patch on the insulated roof and with the roof in such good condition that it is being left intact for another campaign, he concludes.

Rolling Speeds Are Increased

(*Continued from Page 239*)

rolling of steel as now carried on has resulted in still further improvement of metallic and nonmetallic bearings and along with these developments there has been aroused a consciousness of the necessity of proper lubrication and the need of proper design to make possible this lubrication.

The severe duty imposed on rolls when used on 4-high reversing and strip mills has furnished roll builders some real problems and has resulted in the improvement in quality of rolls and in the finish.

Increased use of radiant tube furnaces for annealing and improved methods of pickling have added to the quality of sheets and strip produced during the past year.

Although to some it seemed no new electrical development in auxiliary control could be expected, nevertheless several important improvements in electrical contactors were made during the year 1935.

Activity in hot and cold strip mill construction during the year just closed was exceptionally brisk, comments H. A. Winne, industrial engineering department, General Electric Co., Schenectady, N. Y. The tremendous concentration of power on a continuous hot strip mill is disclosed by a recent installation which requires a total of 39,000 horsepower for driving its 12 continuous stands of rolls. This particular mill, states Mr. Winne, will hot roll strip up to 72 inches wide and will have a maximum delivery speed of about 2000 feet per minute.

In a recent wide strip mill installation an improved method of cooling is used. The motor room and basement form a closed system, with the air recirculated and cooled by means of coolers consisting of finned tubes through which water flows. The hot air discharged from the machines is drawn down through the machine foundations, then through the coolers located in the basement. Then the cooled air is discharged through ducts into the motor room, to pass again through the machine and cooling system.

The motor room, continues Mr. Winne, is kept slightly above atmospheric pressure by means of a "make-up" fan and filter which will supply air to the motor room to make up for whatever leakage may occur. As all leakage will be outward from the system, no dust can enter except the small amount that may get through the make-up filter.

It is evident that with this system

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the motor room will at all times be at a comparatively low temperature, greatly improving the operating conditions for such apparatus as is not directly force-ventilated, and increasing the comfort of the motor-room attendants.

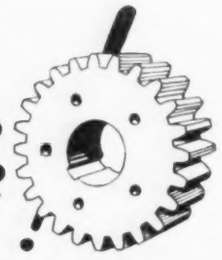
Mr. Winne cites the use of gear motors as "drag generators" on cold strip mill reels—an unusual application. It is desirable to maintain some tension in the strip as it feeds from the coil into the mill. So at each end of the coil a steel cone is mounted on a shaft which is geared to a direct-current gear-motor.

When a coil is in place the two motors and cones are moved toward each other until the cones are firmly wedged in the coil. The fields of the direct-current machines are separately excited, and controlled by a regulator which responds to the current output from the drag-generator armatures, thereby maintaining constant tension in the strip. The power output from the drag generators is transmitted through a motor-generator to the alternating-current power system.

A complete new line of direct-current contactors was developed, which will supersede the "bent-frame" line type in use in steel mill auxiliary control service for over ten years. The new contactors are designed to give longer life and lower maintenance costs, combined with accessibility and ease of repair.

Mr. Winne in conclusion directs attention to factory-assembled control structures which were developed for the first time during the year. Installations were provided for two leading steel mills.

Play Safe



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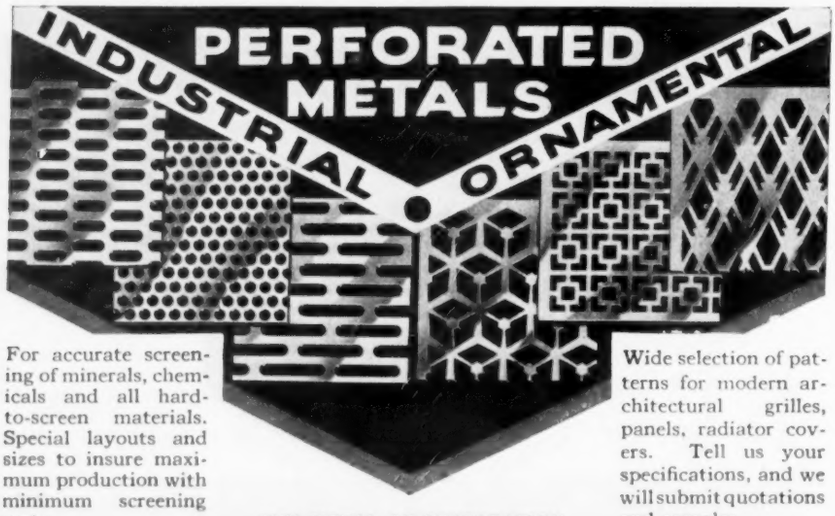

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Need Improved Blast Furnaces

(*Continued from Page* 245)

mobile market, and the marked tightening of specifications on mill products, many expenditures have been made for new finishing mills, for improvements in these departments.

Operators, Mr. Seaver observes, now are beginning to look to savings which may be effected in the more fundamental parts of the operation; i. e., the preparation of raw materials and the processing of these materials into pig iron and ingots, knowing that savings in the handling of raw materials and the production of pig iron and ingots are becoming increasingly important inasmuch as they are reflected in each department as the finishing end is approached.

Blast furnace gas recently has become a most desirable raw material from the standpoint of the steelworks and rolling mill especially where natural gas is available, states Mr. Seaver. In these cases it is being used successfully as a diluent for mixing with higher B.t.u. natural gas for obtaining gas of varying B.t.u. contents for use in various heating operations.

Efficient Gas Consumption

The further extended use of blast furnace gas for mill heating makes it most desirable to effect savings in the use of this fuel at the blast furnace, and in turn release larger quantities for use in the mills. The installation of high-efficiency hot blast stoves and fine gas cleaning in a number of instances has reduced the use of blast furnace gas in blast furnace stoves from 35 to 40 per cent of the volume produced to less than 20 per cent. Numerous small checkered hot blast furnace stoves are in operation today which have efficiencies ranging from 85 to a point above 90 per cent. Plants with these installations are equipped with means for fine cleaning gas, either of the electrical precipitator type or with disintegrators.

Savings in the cost of operating disintegrators have been effected by improvements in the type and number of bars in the rotary and stationary members, and the amount and means of distributing the water in the machines. With an improved type of moisture eliminator, which removes

water and dirt from the gas and the new improvements in bar arrangement, the gas is much cleaner than heretofore has been obtained with any given amount of power used, and therefore, the capacity of the machines has been increased materially. Disintegrators, Mr. Seaver points out in conclusion, may be used successfully for cleaning gas from spiegel and ferromanganese operations, and operating results show this type of gas cleaning entails low capital cost, and that maintenance and operation are at a minimum. Tube-type machines, which afford a small pressure drop, are designed for cleaning quantities of gas well over the rated capacity.

Modernization Brings Profits

(*Continued from Page 246*)

mythical corner to prosperity, poorly equipped, out-of-date plants pass out of the picture entirely, unless they modernize by revamping old equipment, if this is possible, or by replacing it with the most modern now available.—*G. W. Burrell, president, Wellman Engineering Co., Cleveland.*

The past two or three years have brought no more sweeping changes in any tools than in planers.—Today's planer is a high production tool.—for the first time it becomes a special purpose tool.—*B. B. Quillen, president, Cincinnati Planer Co., Cincinnati.*

It is estimated, due to improvement in design, over 60 per cent of the machinery in use today can be replaced economically.—*N. G. Symonds, vice president, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*

We know of actual experience where a shop investing in a modern, up-to-date, heavy duty turret lathe has been able to produce the parts two, three or five times as fast as formerly with the equipment it had.—*O. B. Iles, president, International Machine Tool Co., Indianapolis, Ind.*

Modern methods and precision machines for the cutting of gears, as well as the development and use of special materials, offer the advantages of higher efficiencies, greater durability and strength, which result in longer life and fewer replacements or repairs.—*F. H. Fowler, president, Foote Bros. Gear & Machine Co., Chicago.*

Many executives have found and others are finding every day that, even with current volume, one of the most profitable—and safe—places to invest capital is right in their own plant.—*W. W. Miller, manager industrial department, General Electric Co., Schenectady, N. Y.*

The conclusion that now is the right time to buy is based upon experience borrowed from the past and coupled with a knowledge of present economic conditions.—*M. I. Arms, vice president, Aetna-Standard Engineering Co., Youngstown, O.*

The shop which does not keep its equipment up-to-the-minute in performance cannot attain or maintain required accuracies in finished products, nor can such a shop survive long in modern highly competitive conditions.—*J. E. Andress, president, Barnes Drill Co., Rockford, Ill.*

By proper consideration of the production scheme in any plant, it generally is found that a wholesome condition is one in which the handling equipment pushes the production units, rather than have the production units wait on the handling equipment.—*A. C. Garnett, secretary and treasurer, Cleveland Crane & Engineering Co., Wickliffe, O.*

As gear noises cannot be tolerated today, it is extremely important to use the right type of equipment so that excessive scrap and tear-downs resulting from noisy gears can be eliminated.—*W. F. Slomer, general sales manager, Fellows Gear Shaper Co., Springfield, Vt.*

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ernizing in the iron and steel field, one of the most outstanding is in the power plant.—Worthwhile savings are possible through the installation of modern overhead traveling cranes, conveyors and hoists.—*Gen. T. S. Hammond, president, Whiting Corp., Harvey, Ill.*

The termination of government experimenting alone can bring to fulfillment the great promise of recovery in the heavy industries.—*Charles A. Moore, chairman, Manning, Maxwell & Moore Inc., New York.*

There is a distinct responsibility on the part of management to see that understudies are given the right point of view as to the attitude they should assume in regard to the purchase of new equipment.—*S. Owen Livingston, vice president and general sales manager, Gallmeyer & Livingston Co., Grand Rapids, Mich.*

From data gathered from many hundred of time estimates and equipment surveys for customers, it is apparent that the average yield on most types of modern machine tools, as contrasted to those built over ten years ago, will be between 15 and 25 per cent per annum,—some as high as several hundred per cent per annum.—*George H. Johnson, vice president, Gisholt Machine Co., Madison, Wis.*

Many control installations made as recently as six or seven years ago are out of date today and can be replaced with new ones which will pay for the investment in a reasonable length of time.—*W. H. Williams, vice president and general sales manager, Clark Controller Co., Cleveland.*

Recent developments have resulted in making obsolete any forging machine which is more than five years old. With the same amount of effort, heat, power, labor and other costs, the latest machines yield at least 20 per cent more production than their predecessors.—*D. R. Davies, president, Acme Machinery Co., Cleveland.*

It is certainly to the advantage of the heavy industries to reconsider seriously many present methods of operation and of the construction of machinery.—*E. Blakeney Gleason, vice president, Gleason Works, Rochester, N. Y.*

Perhaps no single development during the past ten years has focused to such an extent the attention of industry upon the advantages of new machine tool equipment, as has the advent of cemented carbides in 1928.—*W. G. Robbins, vice president, Carboloy Co. Inc., Detroit.*

How can any manufacturer using old machine tools compete successfully against the one who has a real replacement program in effect? Obviously, the answer is that he cannot.—*Norman D. MacLeod, president and general manager, Abrasive Machine Tool Co., East Providence, R. I., and president, National Machine Tool Builders' association.*

If I were sitting in a banker's chair today and the head of a manufacturing company approached me for a loan, one of the first questions I would ask would be: "What percentage of your equipment is five years old; what percentage is over ten years old?" The answer, in my mind, would determine quickly whether the company were progressive and in a position to maintain a market for its product by meeting competition.—*T. H. Doan, president, Foote-Burt Co., Cleveland.*

The future holds promise only for the fittest. These are new times; different and better manufacturing methods must be employed in order to keep pace with these new super-production demands. The first requirement of fitness is economy of operation by employment of proper men, equipment and methods.—*H. A. Moore, general sales manager, Foster Machine Co., Elkhart, Ind.*

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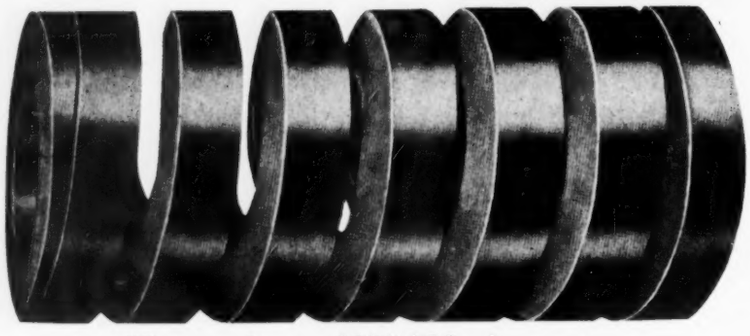

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to keep that ever-receding price trend from tossing us into red ink.—*Maurice Stanley, president, Fafnir Bearing Co., New Britain, Conn.*

At the present time there are dozens of types of special adaptations of electric motors with special characteristics, and enclosing features, which represent the advancement in the art of applying electric power from a production standpoint and in a more efficient method, each one tending to obsolete electrical equipment that is now installed.—*J. W. Corey, sales manager, Reliance Electric & Mfg. Co., Cleveland.*

Wage Rates Steady; Employment Increased

(*Concluded from Page 249*)

pation in the American Federation of Labor. He has been active advocate of the vertical or industrial type of union and has fought for campaigns to organize the steel workers, against the opposition of federation president, William Green.

The drive, however, has not materialized, while the industry's position with its employes undoubtedly has been strengthened by its contacts through the employe representation groups.

The total volume of employment and payrolls in manufacturing industries as a whole showed a fairly substantial gain in 1935 over 1934. The government's index figure for manufacturing employment increased from 78.8 in 1934 to 80.3 in 1935, estimating late months last year. In this index the average for the three years 1923-25 is taken as 100. Payrolls were raised from an index of 61.9 in 1934 to 67.8 in 1935.

Employment in the durable goods industries rose from an index of 61.9 to 67.8; while in nondurable goods the employment figure showed little change, 92.7 in 1934, and 92.4 in 1935. Late returns may modify this slightly.

For durable goods industries, the payroll index advanced from 50.3 in 1934 to 58.2 in 1935; and in nondurable goods, from 76.8 to 80.6.

In iron and steel and their products, not including machinery, the federal index for employment late in the year stood at 73.2, based on the 1923-25 average as 100. Payrolls were 59.6. The per capita weekly earnings were reported as $22.10 the average hours worked per week 35.8 and the average hourly earnings 61.1 cents.

Much higher indexes were reported for machinery, not including transportation equipment. Thus, the index for employment was 87.3, and for payrolls 71.2. The per capita weekly earnings were $23.26, average hours worked per week 38, average hourly earnings 60.3 cents.

Windows of Washington

(*Continued from Page 252*)

proposed amendment to the federal trade commission act enlarging the powers of the commission and granting it more liberal authorization to meet fair trade practice requirements and to establish standards of wage rates and maximum work hours.

Of course, the enactment of the O'Mahoney bill is being urged in some new deal quarters. This bill is based on federal licensing and taxation principles for corporations engaged in interstate commerce operation. Modification of the antitrust laws to accomplish a variety of ends is also being discussed, but there is no thought that anything will be done at this session.

Administration officials—perhaps just to put in their time—also are talking of a plan for a government subsidy as a means of increasing employment and decreasing unemployment. Again consideration is being given to the effect on domestic pro-

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duction of the competition of imports from foreign countries.

Also there has been talk—and considerable, be it said—of the establishment of a national industrial organization representative of labor and management, deriving its authority from similar state organizations, to concern itself with federal and state legislation, and the co-ordination of such legislation. This should not be confused with the so-called Berry plan.

It is expected that the Walsh bill on government contracts, introduced at the last session, will immediately be the center of active consideration of congress. It seeks to establish the wage and hour provisions of the old NRA codes by granting government contracts only to firms which are living up to these provisions, and it further extends the field of such application by requiring certification that the persons from whom the principal contractors are buying their supplies are also living up to acceptable standards.

In the absence of code standards, the President is given the power to establish them. The framers of this legislation believe that it would prevent chiseling and give some degree of control over unfair competition.

The 30-hour week bill also will receive consideration. This bill, which has had strong political support for the past few years, will now have an increased backing because of the impracticability of general NRA legislation.

It, like the Walsh bill, does not deal with the whole question of competitive practices. It does not even attack the problem of low wages. It deals only with the short week.

The strongest argument in behalf of this kind of legislation is that, in spite of all efforts, there remains a pool variously estimated at from 4,000,000 to 11,000,000 unemployed, and that one way to make an appreciable reduction of this pool is to spread all available work over a larger number of people. The only way to do this is to reduce the length of the work week. Even if the objectives of this bill could be achieved in interstate commerce, its application would have to await further decisions of the Supreme Court.

The present machinery for handling voluntary agreements is a makeshift one, entirely too cumbersome. It is certain that voluntary agreements will continue, but that legislation is necessary to extend them and properly to protect the public interest.

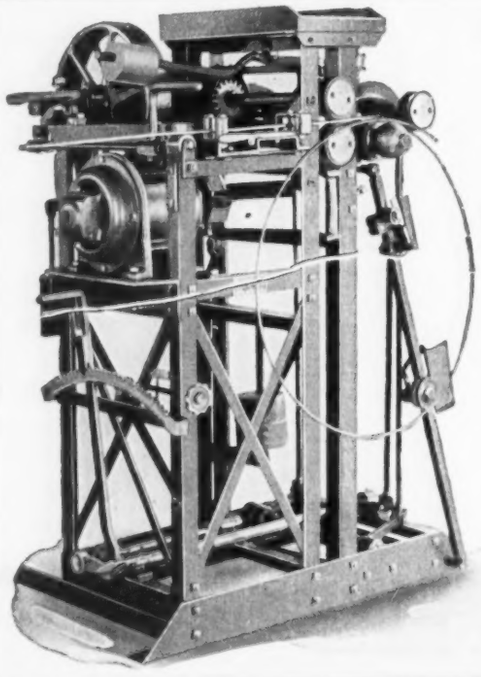
It is believed by those most interested that this should be done through transfer to the federal trade commission of the necessary functions in regard to wage and hour agreements; by an increase in personnel of the commission, by a more careful definition of its functions and powers, and by writing more positive and definite standards into the act.

War Profit Bill Looms

Another bill to which industry has given little attention is the war profits bill introduced by Representative McSwain of North Carolina "to prevent profiteering in time of war." This bill already has passed the house, was favorably reported by the senate committee on military affairs, and has since been referred to the senate finance committee, where it is now resting.

This measure embraces a comprehensive statute intended to be invoked in time of war. It would tax war profits 100 per cent and attempt to meet payment of war expenses out of current profit arising from war industries.

There is also contained in this bill a provision for drafting industrial management for war service through the creation of an industrial management corps, which would form a part of the regular army establishment for war time regulation, and control of commodity exchanges and their operations. There is a very considerable sentiment behind this bill, due largely to the facts which were brought out during the recent congress by the special investigations of the munitions industry.



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Directory of Trade Names of Alloy and Special Analysis Irons and Steels

AS A supplement to the 1936 yearbook issue, STEEL presents a directory of trade or brand names of alloy and special analysis irons and steels. The directory is built around a nucleus of tool steels, corrosion and heat resisting alloys, and high-strength, low-alloy steels. In these classifications the directory is reasonably comprehensive. In addition many of the more common trade names of specially processed iron and steel products are presented.

The directory is in two parts. The first consists of a compilation of trade names under each company, the company names being arranged alphabetically. Each company has been assigned a key number, such as A17, B33, etc. The second part of the directory is an alphabetical list of the significant words or symbols in trade names. Each item in this list is identified by a key number which refers back to the company list.

In Part II, the compilation of the significant elements of trade names, rather than the complete trade names, is believed to facilitate identification. A consumer who can remember any key word or symbol of a trade or brand name, can trace its full name through the liberal cross indexing presented in Part II. For instance, referring to "Cobaltcrom PRK 33," he may recall only the "PRK33." In tracing this element, he will be directed to the source of the complete trade name. Minor grades or types are not cross-indexed.

About 96 per cent of the data presented has been verified by the producers or sellers. In the remaining minority, failure of the makers or agents to reply to our inquiries or unintentional oversight on our part has necessitated the use of unverified names compiled from advertisements or current technical literature. Recognizing the possibility of error or omission, STEEL invites constructive criticism of the directory to the end that revisions may be included in future editions.

THE EDITORS

Part I

A

A 3 Achorn Steel Co., Boston.
Carbon Tool Steels: Fagersta Best, Fagersta Chisel, Fagersta Cold Heading, Fagersta Envelope Die, Fagersta Extra Cutlery; Fagersta Mining, Fagersta Shoe Die, Fagersta Standard, Fagersta Standard Cutlery, Kloster Rema, Fagersta Special Carbon, Fagersta Extra Carbon.
Special Alloy Tool Steels: Dannemora DB59, Fagersta Fast, Fagersta Hack Saw, Fagersta Hot Die, Fagersta Unbreakable Chisel, Fagersta White-Gold, Polhem Wire Drawing, Special Alloy Die Steel.
High Speed Tool Steel: Kloster Prior Extra.
Non-Deforming Tool Steels: Fagersta Superior, Fagersta High Production.

A 6 Acme Steel Co., Chicago.
Stainless Steels: Acme Stainless Steel (Types 410, 425, 430, 302 and 304).

A 9 Adams Steel Co., W. E., Boston.
Carbon Tool Steels: Balfour's Shoe Die, Balfosteel Brand, Best, Blue Label, Dannemora Extra Best, Hacksaw (Reg. C), Very Best.
Special Alloy Tool Steels: Dannemora Self-Hardening, Dannemora No. 0, Hacksaw, Hot Die.
High Speed Tool Steels: Ultra Capital Plus One, Ultra Capital.
Non-Deforming Tool Steel: Griffin Brand.

A12 Ajax Tool Steel Sales, New York.
Carbon Tool Steels: 4 Best, 5 Best, EZH Extra Best, EZH Special, F.S. Extra Best, SR 4 Regular.
Special Alloy Tool Steels: 212, CR, CR 2, Cv, 2002 E S, HPS, O Diamond, SP, 2002 Special, SPS, SST, Tenax N, Tenax NB.
High Speed Tool Steels: Poldi MK; Poldimaximum, Poldimaximum Special, Poldimaximum Special 55.
Non-Deforming Tool Steel: Poldi Stabil.
Corrosion and Heat Resisting Alloys: Poldi (Types AK 1, AK 2, AK 5 and AK H.

A15 Allegheny Steel Co., Brackenridge, Pa.
Stainless Steels:
Allegheny Metal (Types A, B, B Special, C, A-Ti), Free Machining quality.
Allegheny 22, Allegheny 22 Special.
Allegheny 33 (Types 405, 410 and 416).
Allegheny 33 Turbine quality (Type 403).
Allegheny 33 W (Type 418).
Allegheny 44 (Type 309).
Allegheny 46, Allegheny 46 Molybdenum, Allegheny 46 Tungsten.
Allegheny 55 (Type 446).
Allegheny 66 (Type 430), Allegheny 66 W (Type 438).
Allegheny 67 (Type 442).
Allegheny 2520 (Type 310).
Allegheny Ohmaloy (Type 406).

A18 Allen Steel Co., Inc., Edgar, New York.
Carbon Tool Steels: Class E, Class H Steel, f.s.d. Cast Steel, Stag, Talon.
Special Alloy Tool Steels: No. 4 Hot Work, No. 5 Hot Work, Imperial Turning and Finishing, Maxnap, Minerva Special Chisel, Red Label, Self Hardening.
High Speed Tool Steels: High Speed No. 2, Imperial Extra Special, Imperial Major, Imperial Special.
Non-Deforming Tool Steels: K 9, Double Six.

A21 Alloy Metal Wire Co., Moore, Pa.
Resistance Materials: Acme (Ni-Cr Iron); Excelsior (Cu Ni); Premier (Ni Cr Iron); Superior (Ni-Cr).
Stainless Iron, Stainless Steel, Monel, Nickel.

A24 Aluminum Industries, Inc., Cincinnati.
Aluminum Alloy Castings: Permite.

A30 American Manganese Steel Co., Chicago Heights, Ill.
Corrosion, Acid and Heat Resisting Cast Steel: Amsco (Types F-1, F-3, F-5, F-6, F-8, F-8 Mo and F-10).

A35 American Rolling Mill Co., Middletown, O.
Stainless Steels: Armco 16-6 Stainless Steel (Types 301, 301S), Armco 18-8 Stainless Steel (Types 302, 304), Armco 19-9 Stainless Steel (Types 305, 306), Armco 20-10 Stainless Steel (Types 307, 308), Armco 25-12 Stainless Steel (Type 309), Armco RA Stainless Steel (Type 434A), Armco 15 Stainless Steel (Type 425), Armco 17 Stainless Steel (Type 430).
Electrical Sheets.
Pure Iron: Armco Ingot Iron.
High Tensile Steel: Armco H.T.-50.

A40 American Sheet & Tin Plate Co., Pittsburgh.
Black, Galvanized and Electrical Sheets; Coke, Charcoal and Terne Plate: American.
Copper-bearing Sheets: Keystone.
Galvanized Sheets: Apollo.

Cold Reduced Black and Tin Plate: Superdraw.
Stainless Steel Sheets: **U S S Stainless.**
Vitreous Enameling Sheets: Vitrenamel.
High Tensile Sheets: U S S Cor-Ten, U S S Man-Ten.

A42 American Steel & Wire Co., Chicago.
Stainless Strip Steel, Cold Finished Bars, Wire: USS Stainless.
High Strength Low Alloy Steel Strip and Wire: USS Cor-Ten, USS Man-Ten.

A45 Anchor Drawn Steel Co., Latrobe, Pa.
(See list under Vanadium-Alloys Steel Co.—V5).

A48 Andrews Steel Co., Newport, Ky.
Alloy Steels (Ni, Cr-Ni, C-V, Cr-V, Ni-Mo, Cr-Mo, Cr, etc.) for Petroleum Industry and General Manufacturing: Asco.

A52 Apollo Steel Co., Apollo, Pa.
Apollo Steel Co.
Copper-Bearing Steel: Apolloy Metal.

A55 Armstrong Bros. Tool Co., Chicago.
Carbide Cutting Metal: Armide.
High Speed Steel: Armstrong.

A60 Atlantic Steel Co., New York.
Special Alloy Tool Steels: Atlantic No. 33, Atsco.

B

B 3 Babcock & Wilcox Co., Barberton, O.
Corrosion and Heat Resisting Alloys: B & W, Enduro, Nirosta.

B 8 Bethlehem Foundry & Machine Co., Bethlehem, Pa.
Silicon Cast Iron: Tantiron.

B10 Bethlehem Steel Co., Bethlehem, Pa.
Carbon Tool Steels: X, XCL, XX, XXX.
Special Alloy Tool Steels: Finishing, Lehigh Die and Tool, No. 57 (Hot Work), No. 71 Alloy, No. 445 (Hot Work), Omega, Superior, Tough.
High Speed Tool Steels: Comokut, Extra Special, Special.
Non-Deforming Tool Steel: Tool Room.
Stainless Steels: Bethadur (Types Nos. 1, 2, 3, 4, 5, 6, 7, 9); Bethalon (Free Machining Corrosion-Resisting Iron Type); Bethalon B (Free Machining 18-8).
Chrome-Nickel Alloy Steel: Mayari.
High Temperature Alloy Steels: Supertemp, Mayari "A".
Spring Steel: Bethlehem Silico-Manganese.
Copper-Bearing Steel: Beth-Cu-Loy.
Wide Flange Beams, Girders and Columns: Bethlehem.
Special Zinc-Coated Wire: Bethanized Wire.

B15 Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.
Alloy Cast Steel: Birdsboro (Types Nos. 26 and 30).

B18 Bissett Steel Co., Cleveland.
Carbon Tool Steels: Very Best Brand, Best Brand, Carbo Brand.
Alloy Tool Steels: Gupmore Hot Work Steel, Checkno Hot Work Steel.
Oil Hardening Steels: Nonshrink Brand, R. B. Brand.

B24 Bliss & Laughlin, Inc.
Cold Drawn Steels: Ultra-Cut Steel, B & L Small Rounds.

B27 Boker & Co., Inc., H., New York.
Carbon Tool Steels: Gibralter.
Special Alloy Tool Steels: Air Hardening, BND, Boker Power Chisel, Kinite, Self-Hardening, Super-Chrome Die.
High Speed Tool Steels: Novo Superior.
Non-Deforming Tool Steels: Intra, Water Hardening.

B31 Boyd-Wagner Co., Chicago.
Carbon Tool Steels: B-W Point 5, Best Carbon, Standard Carbon, No. 4, No. 9, No. 41.
Special Alloy Tool Steels: Bowco Water Hardening Tubing, E. Z. 14 W Swedish Hot Die, Hypro No. 62 High-Carbon High Chrome, Crown W, Very Best, Special No. 18, Die Cast and Impress.
High Speed Steels: Bowco, Bowco Cobalt, Rekord Extra, Rekord Superior.
Non-Deforming Tool Steels: Arrow Oil Hardening, Bowco Oil Hardening Tubing, Hy-Lo Oil Hardening, Moldie.

B36 Braeburn Alloy Steel Corp., Braeburn, Pa.
Carbon Tool Steels: Extra, Special, Standard.
Special Alloy Tool Steels: Alloy Finishing, Chrome Vanadium, Hot Die No. 2, Keystone, Pressurdie, Superior, T Alloy, Titan, Vibro, Viking.
High Speed Tool Steels: Bonded Carbide, Cobalt, Twinvan, Vinco, Gyro, Mo-Cut.
Non-Deforming Tool Steel: Kiski.
Stainless Steel: Braeburn Stainless

B42 Burgess-Parr Co., Freeport, Ill.
Acid Resisting Alloy: Illium.

B40 Burden Iron Co., Troy, N. Y.
Wrought Iron: Burden Best.

C

C 8 Cannon-Stein Steel Corp., Syracuse, N. Y.
Carbon Tool Steels: Rita Electric, Rita Extra, Rita Special Drill Rod, Rita Standard, Rita Standard Drill Rod.
Special Alloy Tool Steels: Rita Car-Van Die, Rita Chrome-Vanadium, Rita Extra Special, Rita Hot Forging Die (Nos. 1 and 2), Rita Special, Rita T. C. V. Alloy, Rita Vanadium Drill Rod.
High Speed Tool Steels: Rita Cobalt, Rita High Speed.
Non-Deforming Tool Steels: Rita No-Change Oil Hardening, Rita Oil Hardening Drill Rod, Rita 3-Point Die Oil.
Chrome-Nickel Alloy Steels: Rita.

C11 Carboloy Co., Inc., Detroit.
Cemented Carbides: Carboloy.
Special Alloy Tool Material: No. 548.
Tungsten, Titanium and Tantalum Carbides: Carboloy.

C15 Carnegie-Illinois Steel Corp., Pittsburgh.
High Strength Steels: USS Cor-Ten, USS Man-Ten, USS Sil-Ten, USS High Tensile.
Corrosion Resisting Steels: USS Stainless.
Structural Shapes: C B Sections.
Sheet Steel Piling: Carnegie-Illinois Sheet Steel Piling.
Floor Construction: I-Beam-Lok, T-Tri-Lok.
Stainless Clad Steel: USS Plykrome.

C21 Carpenter Steel Co., Reading, Pa.
Carbon Tool Steels: Special, Extra, Comet, Titan, H-9 Extra.
Special Alloy Tool Steels: Excelo, D. Y. O., K-W, Solar.
High Speed Tool Steels: Gold Star, Star-Zenith, Star-Moly.
Non-Deforming Tool Steels: 610 Air Hardening, Hampden, Stentor, R. D. S.
Stainless Steels: Stainless Steel (Types No. 1, No. N-1, No. 2, No. 2B, No. 3, No. 4, No. 5, No. 6, No. 7, No. 8.
Automotive Alloy Steels: Flexo; Nos. 1, 2, 4 and 5 Samson; No. 2-317, No. 4-317, No. 5-317, No. 158, No. 3-314, No. 2-408, No. 4-408, No. 2-547, No. 3-547, No. 500, No. 2-720, No. 5-720, No. 3-427, No. 5-427, No. 436.
Miscellaneous Alloy Steels: N-30, Presto Steel, Magnet Steel.

C25 Central Iron & Steel Co., Harrisburg, Pa.
High Tensile Alloy Steel: Centralloy Steel.

C27 Chambersburg Engineering Co., Chambersburg, Pa.
Nickel-Molybdenum Air Furnace Iron Alloys: Cecolloy.

C29 Chapman Valve Mfg. Co., Indian Orchard, Mass.
Corrosion Resisting Iron: Davis metal.
Alloy Steel: Chrome Tungsten Steel (patented).

C33 Chicago Steel Foundry, Chicago.
Corrosion and Heat Resisting Cast Steel: Pyrasteel (Types No. 18, No. 20 and Special).
Alloy Cast Steel: Evansteel.

C38 Cleveland Twist Drill Co., Cleveland.
Special Alloy Tool Steel: Mo-Max.

C41 Cold Metal Process Co., Youngstown, O.
Cold Rolled Strip Steel: Precision.

C45 Colonial Steel Co., Pittsburgh.
(See list under Vanadium-Alloys Steel Co.—V5).

C49 Columbia Tool Steel Co., Chicago Heights, Ill.
Carbon Tool Steels: Columbia (Types Extra, Special and Standard), Electrex, Eureka.
Special Alloy Tool Steels: Artdie, Buster Brand, Die Block, Double Special, Durite, Extra Vanadium, Phoenix, Self Hardening, Superdie, Tapdie, Waterdie.
High Speed Tool Steels: Clarite, Maxite, Vanite.
Non-Deforming Tool Steels: Oildie, Exl-Die.
Stainless Steels: Stainex (Types Nos. 1, 2, 3).

C53 Continental Roll & Steel Foundry Co., East Chicago, Ind.
Hard Alloy for Rolls: Cromonite Chill (Grades A, B, C), Duquesne Special, Hubbard Special, Wheeling Super Steel, Wheeling Metal.
Alloy Cast Steel: Cro Mol C-10; Dynamic Steel (Types C-2, C-3, C-4); Molybdenite, C-6; Temp Alloy, C-27.

C57 Continental Steel Corp., Kokomo, Ind.
High Grade Basic Open-Hearth Steel (Cu, Ni, Cr.): Konik Steel.
Sheets: Galvannealed, Super-Metal.

C61 Cooper Alloy Foundry, Elizabeth, N. J.
Corrosion and Heat Resisting Cast Iron: Sweetalloy (Types 16, 17 Ka-2, 17S, 17S Mo, 18, 19, 20, 21, 22, KA-4, KNC-3.

C64 Craine-Schrage Steel Co., Detroit.
Carbon Tool Steels: Crasco Green Label, Crasco White Label.
Special Alloy Tool Steels: Crasco Finishing, Crasco Special Vanadium.
High Speed Tool Steels: Crasco High Speed, Crasco Tool Bits.
Non-Deforming Tool Steel: Crasco Black Label, Crasco Red Label.

C68 Crucible Electric Steel Co., Homestead, Pa.
Special Alloy Tool Steels: Super Cesco Diamond, "Cesco Diamond" Special.

C71 Crucible Steel Casting Co., Cleveland.
Heat, Corrosion and Wear Resisting Alloys: Par (Types 1, 2, 3, 4, 5, 6, 7, 2C, 9, 9A, 10A, 11, 11A).

C75 Crucible Steel Co. of America, New York.
Carbon Tool Steels: B. D. Tool, Black Diamond Drill, Crusea, Extra Tool, LaBelle Eagle, Park Silver, Peerless Extra, Regular Tool, Special Tool.
Special Alloy Tool Steels: Airdi, Alva, Atha, Champion, Crescent, Crusea, Double Special, Hack Saw Steel, N. Y. C. C., LaBelle, 183 Mix, Peerless, Self Hardening, Special Shell Turning, Tack Die, Triple Alloy Punch, Wortle Die.
High Speed Tool Steels: Champion, Rex A, Rex AA, Rex AAA, Rex 95.

Corrosion and Heat Resisting Alloys: Cro Sil, Lo Cro, Rezistal.
Non-Deforming Tool Steel: Paragon.
High Strength Alloy Steels: Duplex, Max-El, Simplex.
Nitriding Steels: Nitralloy.

C79 Cyclops Steel Co., Titusville, Pa.
Carbon Tool Steels: Cyclops (Types Extra, Special, Standard, Cyclo).
Special Alloy Tool Steels: Alco, Apollo, Ajax, B-4, Cyclo Draco, Standard Draco, Extra Draco, Special Draco, K, Orion, Para, Saturn, Titus.
High Speed Tool Steels: B-6, B-7, B-9, M-T, Super MoTung.
Non-Deforming Tool Steels: Ultradie (Types Nos. 1 and 2), Wando.
Corrosion and Heat Resisting Alloys: Cyclops (Types K Rustless Steel, No. 17-A, No. 17-B Metal), Uniloy (Types 18-8, 18-8S, 21-12, 4-11, 1409, 1435 Grade A Stainless, 1809, 1860 Grade B Stainless, 2825, 1409M Free Machining Grade, 18-8M Free Machining Grade).

D

D 3 Darwin & Milner, Inc., Cleveland.
Special Alloy Tool Steels: A-B-C, Firex, "H" Die Steel, Ideor, SIWI, N-32.
High Speed Tool Steels: Cannon, Darwin "505", "1366".
Non-Deforming Tool Steels: Cobaltcrom-PRK 33, Neor.
Corrosion and Heat Resisting Alloys: Cobaltchrome PRK 33, Cobaltchrome (Stainless), Pireks C-C, Pireks R-C-C, Pireks-Reactal.

D 7 Delaware Tool Steel Corp., East Wilmington, Del.
Carbon Tool Steels: Delaware Extra, Delaware Standard.
Special Alloy Tool Steels: Cartun, C-4, Delsteel Alloy, Drillalloy.
High Speed Tool Steels: National, P-D Tungsten.
Non-Deforming Tool Steels: HC-HC, Pennant.

D10 Detroit Alloy Steel Co., Detroit.
Alloy Steel Castings: Castaloy, Martin Steel, Krokoloy (Chrome-Cobalt).
Oil Hardening Tool Steel Castings: Carbomang.

D15 Disston & Sons, Inc., Henry, Philadelphia.
Carbon Tool Steels: Best, Extra, Standard, D-1, D-2, Va tool.
Special Alloy Tool Steels: Eltun, HRW, Keystone Alloy Chisel, Special Alloy, Nicroman, 812 Die, Croloy, D-9-Va, Celero, D-29, Polanis.
High Speed Tool Steel: Kutkwik.
Non-Deforming Tool Steel: Mansil Oil Hardening.
Corrosion Resisting Alloys: Stainless Iron, Stainless Steel (Types A and B).

D18 Driver Co., Wilbur B., Newark, N. J.
Corrosion and Heat Resisting Alloys: Cobanic, Cromin D, Cupron, Modified Hilo, Molymet, Monel, Stainless Steel, Tophet (Types A, B, C, D).
Alloy for Electrical Uses: Manganin.

D21 Driver-Harris Co., Harrison, N. J.
Corrosion and Heat Resisting Alloys: Advance, Chromax, Cimet, Nichrome, Ohmax, Radiohm, 525 Alloy, DH KA-2.
Miscellaneous Alloys: Comet, Hytemco, Nilvar.

D24 Duraloy Co., Pittsburgh.
Corrosion and Heat Resisting Alloys: Duraloy (Types A, B, C, H, H2, N, X, 18-8, 1535.

D28 Duriron Co., Inc., Dayton, O.
Corrosion and Heat Resisting Alloys: Alcumite, Durco (Types 18-8, 28-12, D-12, D-18, KA-2, KA-2 Mo., KA-25, KA-2S Mo.), Durichlor, Durimet (Types K and L), Duriron.

E

E 3 Edgcomb Steel Co., Philadelphia.
Carbon Tool Steels: Beacon, Planet Special, Pyramid Special.

E 6 Ekstrand & Tholand, Inc., New York.
Carbon Tool Steel: J c/c.

E 9 Electric Steel Foundry Co., Portland, Ore.
Corrosion and Heat Resisting Stainless Cast Steels: Esco Stainless (Types Nos. 33, 34, 35, 36, 40, 43, 44, 45).

E14 Electro Alloys Co., Elyria, O.
Corrosion and Heat Resisting Alloys: Thermalloy (Types A, B, C, D, 18-8, E 24-12).

E20 Empire Sheet & Tin Plate Co., Mansfield, O.
Enameling Steel Sheets: Wabik Metal, P & A Enameling.
Black Coated Steel Sheets: Black Beauty.
Electrical Sheets: Stanelec (Field Grade), Armelec (Armature Grade), Manelec (Electrical Grade), Motelec (Special Motors), Dynelec (Special Dynamo), Tranelec (A, B and C).

E24 Empire Steel Castings Co., Inc., Reading, Pa.
Corrosion and Heat Resisting Castings: Empire (Types 5, 12, 12a, 12b, 12c, 12d, 18, 18a, 18b, 18c, 18Cu, 18-8, 18-8 Mo., 18-8 Mo Se, 18-8 Se, 18-8 Si, 24-12, 24-12b, 24-12W, 25-5, 25-12, 25-12W, 30, 30a, 30-20, 35-15, 60-20, 60-20a, 75-20 D).

F

F 4 Farrell-Cheek Steel Co., Sandusky, O.
Cast Steel resistant to wear, abrasion, excessive shock and load: Farrell's 85.

F 8 Finkl & Sons Co., A., Chicago.
Special Alloy Steels: Mo-Lyb-Die (Types C, D, R, X).

F11 Firth-Sterling Steel Co., McKeesport, Pa.
Carbon Tool Steels: Special A.S.V., Best, Extra, Sterling, Vanadium Steel, Silver Star, Sterling XX, Diamond "M," Ster "M," Ster "V."
Special Alloy Steels: Cromovan, Triple Die, A. W. Special, C. Y. W. Choice, Double Special, R. T. Steel, Extra Special, L. T. Forging Steel, Sterling Nitrard No. 1, Finis, W. D. D., J. S. Chisel Steel, Chimo Chisel Steel; "XDH," "XDM" and "XDL" Extrusion Die Steels.
High Speed Tool Steels: Circle C, Blue Chip, H. V. Blue Chip, H. M. Blue Chip, Hot Work Blue Chip.
Non-Deforming Tool Steel: Invaro.
Cemented Carbides: Firthite, Firthaloy, Firtheld Dies.
Corrosion and Heat Resisting Alloys: Sterling Nirosta (Types "FC," KA2, KA2S, 19-9), Sterling Stainless (Types "A," "B," "BHH," "FC," "M," "MG," "T," "TX."
Cold Drawn Tool Steels: Globe (Polished Drill Rods); Meteor, Blue Chip (Drill Rods); Needle Wire; Stainless Spring Steel.

F15 Forging & Casting Corp., Ferndale, Mich.
Oil Hardening Alloy Steels: F. C. C. (Types Nos. 1, 2, 5, 7, 10, 11, 19, 21, 22, 23, 26, 27, 44 HIA, 46M, 47M, 53, 5 x 1). Cast to shape: F. C. C. Oil Hardening, F. C. T. M. S.
Air Hardening Alloy Steels: F. C. C. (Types Nos. 48M, 66). Cast to Shape: F. C. C. (Types Air Hardening, No. 66), PRK-33.
Oil or Air Hardening Alloy Steels: F. C. C. No. 14. Cast to Shape: F. C. C. C. M. S.
Water Hardening Alloy Steels: F. C. C. (Types Nos. 4, 20, 34M Water, 39).
Stainless Steel (Cast to Shape): F. C. C. No. 17.
Carbon Tool Steel Cast to Shape: F. C. C. Carbon Tool Steel.
Miscellaneous Alloy Steels: F. C. C. (Types Nos. 6, 25, 38M).
Centrifugally Cast Iron: Nitri-Castiron.

F18 Fort Pitt Steel Casting Co., McKeesport, Pa.
Wear Resisting Alloy Cast Steel: Tufaloy.

F21 Frasse & Co., Inc., Peter A., New York.
Carbon Tool Steels: Frasse Tempers "A," "B" and "C," Kronos.
Special Alloy Tool Steels: Grade H.
High Speed Tool Steel: Maximum.

G

G 4 General Alloys Co., Boston.
Corrosion and Heat Resisting Castings: Economet 4, Genalloy-B, Q-Alloy (Types A, B, B Si, C1, C2, CN1, CN1-H, CN1-H Mo, CN 2-A), Q-Alloy Chrome (Types C1, C1a, C2a, C2b, C2c, C2d, C2e, C3, C3a, CN1a, CN1b, CN1s, J, KA-2, KA-2H, KA2Mo, KA-2S, KA-4, KNC-3), X-ite.

G11 Granite City Steel Co., Granite City, Ill.
Special Galvanized Sheets: Granite City Galvannealed.
Stainless Clad Sheets and Plates: Granite City Ing-A-Clad.
Copper-Bearing Steel: Granite City.
Electrical Sheets: Granite City.

G15 Gunite Foundries Corp., Rockford, Ill.
Heat Treated White Iron: Z-Metal.
High Test Cast Iron: Gunite.

H

H 3 Halcomb Steel Co., Syracuse, N. Y.
Carbon Tool Steels: Extra Special, Extra Warranted, Special, Standard.
Special Alloy Tool Steels: Air Hardening, C. C. S. Die Casting, Double Special, Halco, Halcomb CSM, Haldi, Krovan, Liberty, Marathon, Peerless Cold Header Die, Pyro, Special Vanadium, Thermo, Wortle Die.
Hot Work Steels: Halcomb Hot Work, L. C. T., L. C. T. No. 2, L. L. C. T.
High Speed Tool Steels: Baltoc, Dreadnought, Halcomb 999, Super Dreadnought, Super Van Dreadnought.
Non-Deforming Tool Steel: Ketos.
Corrosion and Heat Resisting Alloys: Rezistal (Types KA-2, FM-188, 2-C, KA-2-SMO, 3, 4, 7, 238), Rezistal Stainless (Types Iron No. 12, FM-2, Iron No. 17, Iron No. 20, Iron No. 27, Steel "A", Steel "B", Steel B-100).

H 9 Hawkridge Bros. Co., Boston.
Carbon Tool Steels: Hawk-Brand, Hawk Impacto, Hawk Special.
Special Alloy Tool Steels: Hawk H, Hawk Vanadium.
Corrosion and Heat Resisting Alloys: Grade A Stainless Steel, Grade B Stainless Steel, Grade B-100 High Carbon, Rezistal (Types 2C, 2CW, No. 3, No. 4, No. 7, (NcT3), FM 2, KA-2, KA-2FM, KA-2 Mo, KA-2 MoT, KA-25, KA-25 Mo, KA- 25 MoT, NCR-238), Rezistal Safweld (Types KA-2ST, KA-2T), Rezistal Stainless (Types Nos. 16, 18, 24), Rezistal Stainless Iron No. 12, Stainless Steel H. C.

H11 Haynes Stellite Co., New York.
Nonferrous Cutting Alloys: Haynes Stellite J-Metal, Haynes Stellite No. 3.
Corrosion Resistant Alloys: Hastelloy (Types "A," "C" and "D").
Heat and Wear Resistant Alloys: Haynes Stellite (Types Nos. 1, 6 and 12), Haystellite, Hascrome.

H14 Heller Bros. Co., Newark, N. J.
Carbon Tool Steels: Electric Brand White Label, Blue Label Special, Green Label Extra.
Special Alloy Tool Steels: Brown Label Hot Work, Orange Label Chisel, Yellow Label Die, 70-20 M, 70-20 V.
High Speed Tool Steels: Peerless Red Label, Peerless Special Gold Label.
Non-Deforming Tool Steel: Gray Label.

H18 Heppenstall Co., Pittsburgh.
Special Alloy Tool Steels: EIS Grades.

Corrosion and Heat Resisting Alloys: EIS-45.
High Strength Alloy Steel: Heppenstall Grade 2-C-30.
Abrasion Resisting Alloy Steels: Hardtem, Kleencut.

H21 Hidalgo Steel Co., New York.
Carbon Tool Steels: Janus, Milo, Uranus Extra, Weldo.
Special Alloy Tool Steels: Hidalgo, Special D, Unico, W.3, W.9.
High Speed Tool Steels: Triple Express A, Visto.
Non-Deforming Tool Steel: Chrome B 15.

H26 Hobson Houghton & Co., Inc., New York.
Carbon Tool Steels: Choice Drill Rods, Choice XX. Special Tap Rods, Warranted Best.
Special Alloy Tool Steels: Fast Finishing, Soho Self-Hardening.
High Speed Tool Steel: Albion Special.
Non-Deforming Tool Steel: Oil Hardening.
Spring Wire and Needle Wire: Houghton's Superior.

H29 Hoskins Mfg. Co., Detroit.
Heat Resisting Alloys: Chromel (Types A, C and No. 502).

H33 Houghton & Richards Inc., Boston.
Carbon Tool Steels: Extra Quality, First Quality.
Special Alloy Tool Steels: Gold Label, M. Y., M. Y. Extra, Special K. Die, W.K.Z. Hot Work.
High Speed Tool Steels: Super Rapid Extra, White Label.
Non-Deforming Tool Steel: Extra M.G.

I

I 3 Industrial Steel Casting Co., Toledo, O.
Alloy Steel Castings: Toledo.

I 7 Ingersoll Steel & Disc Co., Chicago.
Stainless Clad Steel: IngAclad.

I10 Inland Steel Co., Chicago.
Copper-Bearing Steel in All Forms: Inland.
High Strength, High Corrosion Resistant Alloy: Inland Hi-Steel.
Galvanized Sheets: Inland.

I 17 Inter-State Foundry & Machine Co., Johnson City, Tenn.
Stainless Steel Castings: KA-2.

J

J 3 Jessop & Sons, Inc., William, New York.
Carbon Tool Steels: W. J. S. (Types Extra Best Crucible Cast Steel, Extra Best Sheet Crucible Cast Steel, Special Crucible Cast Steel, Extra Tool Steel, Ordinary Tool Steel).
Special Alloy Tool Steels: Albor, Alloy B, Alloy C, Ark, Ark Superior, Ark Superlative, Ark Supreme, B.B. Hot Die, Composite Die, Duro, Hack Saw, J-4 Chisel, Superior Oil Hardening, Circular Saw Plates.
Stainless Steels: Corrosion Resistant (Types R-1, R-2, R-3, R-4).

J 6 Jessop Steel Co., Washington, Pa.
Carbon Tool Steels: Centaur, Chippeway, Domestic, Lion, Miner's Drill, Utilitas, Washington.
Special Alloy Tool Steels: 2 B Hot Die, High Carbon, Alloy, Hot Stamping Alloy Die, J J Hot Work, L.C.H.S. Chisel, Rapid Finishing, Shock Resisting, Special Alloy, Special Oil Hardening, Top Notch, Zip-Zip Chisel.
High Steel Tool Steels: Jessco, Purple Label, Special, Supremus, Supremus Extra.
Non-Deforming Tool Steels: 3-C Die, Truform, Truform Special.
Corrosion and Heat Resisting Alloys: Duro-Gloss (Types C 1, C 2, C 2-2, C 3, C 4, C 12, 5) Heat Resisting (Types No. 4, No. 5), Hi-Gloss, Sta-Gloss, Sta-Gloss B.

J 15 Jones & Laughlin Steel Corp., Pittsburgh.
High Tensile Steel: Jal-Ten.
Free Machining Steel: Jalcase.
Special Tin Plate: Jalcold.
Oxygen-welded Pipe and Tubing: Jalweld.

K

K 4 Kidd Drawn Steel Co., Aliquippa, Pa.
Carbon Tool Steels: Ajax Drill Rod, Invincible Drill Rod, Unit Drill Rod.
Special Alloy Tool Steel: Special Vanadium.

K 9 Kinite Corp., Milwaukee.
Die Steel (Cast to Shape): Kinite (air hardening), K. O. H. (oil hardening).
Copper-Nickel Castings, Special Electrical Alloy Steels and Irons: XX Metal.

K15 Kloster Steel Corp., Chicago.
Carbon Tool Steels: "Pure-Ore" (Types Standard, Extra and Special).
Special Alloy Tool Steels: "Pure-Ore" (Types Hi-Chrome Hi-Carbon, Super Alloy, No. 25 Special Alloy), Dannemora (Types D-65, A-D-95), "Chiz-Alloy".
Non-Deforming Tool Steel: "Swed-Oil".
High Speed Steel: Prior Extra.
Swedish Iron: "Ram Brand".

L

L 2 Laclede Steel Co., St. Louis.
Strip, Wire, Pipe, Bars: Laclede.

L 4 LaSalle Steel Co., Chicago.
Cold Finished Steels: La Salle Structured.

L 5 Latrobe Electric Steel Co., Latrobe, Pa.
Carbon Tool Steels: Extra Carbon, Special Carbon, Standard Carbon.
Special Alloy Tool Steels: Aldivan, Arrow, C. F. S., Crown, E. H. W., E. V. S., Extra Punch, Dy-Cast No. 1, Extra Special Alloy, Extrusion Die, G. S. N., G. S. N. Special, Lumdie, M Cr, M Cr Mo, Staminal, P. X. D., Renown, Select, Special Punch, Superb, Supreme, W. Tap, W. W. S. H., Truedge, Wolva, Wortle, X. L. Chisel, Z. T. Die, CC Chisel.
High Speed Tool Steels: Electrite (Types No. 1, Uranium, Uranium "B", Cobalt, Super Cobalt, Ultra Cobalt, Vanadium), Tatmo.
Non-Deforming Tool Steels: Mangano, Mangano Special.
Magnet Steels: Chrome Magnet, Tungsten Magnet, Cobalt Magnet.
Corrosion and Heat Resisting Alloys: Stainless Iron (Types L, LM, LS, LMS, M, H, HH, 18-8, 18-8-Mo, 18-8-S, 18-8-Se, 12-11½, 25-12, 25-20), Lesco (Types E-Z Stainless Steel, Regular Stainless Steel, Hy-Glo Stainless Steel, Radianite Stainless Steel, Lusterite Stainless Steel G, S, N, G, S, N, Special), Crobalt Stainless Steel.
Miscellaneous Alloy Steels: Duo-Composite Steels.

L 7 Lebanon Steel Foundry, Lebanon, Pa.
Corrosion Resisting Castings: Circle L.
Nitrided Steel Castings: Nitralloy.

L 9 Logan Iron & Steel Co., Philadelphia.
Staybolt Iron: Logan, S L B.
Double Refined Engine Bolt Iron: Lisco.
Single Refined Engine Bolt Iron: Lico.

L12 Ludlum Steel Co., Watervliet, N. Y.
Carbon Tool Steels: Pompton, Pompton Extra, Pompton Special, Corinth.
Special Alloy Tool Steels: Albany, Atlas 93, Chrome Die, Crow, Mohawk Hot Die, Python, Seminole, Atlas 50, 602 Chisel, LSD.
High Speed Tool Steel: LXX High Speed, Super Panther, Panther Special, ML, LMW.
Non-Deforming Tool Steel: Deward, Huron, Ontario, Saratoga, Utica.
Steel for Balls and Ball Races: Teton.
Corrosion and Heat Resisting Alloys: Silcrome (Types 12, 12 EZ, 17, 25-12, 25-20, H-17, KA 2, M-17, RA, KA2-S, KA2-SMO, 21, 23, KA 2-C, 4-6 Cr., KA2-EZ, L-12.

L15 Lukens Steel Co., Coatesville, Pa.
High Strength Alloy Steels: Lukens (Types Cromansil, Nickel, Carbon-Molybdenum, Chrome - Vanadium, Manganese-Vanadium, Silico-Manganese).
Welding Steels: Lukens Welding Quality, Lukens Weldrite.
Abrasion-Resisting Steels: Lukens (Types Chrome-Manganese, Chrome-Nickel, Manganese).
Corrosion Resisting Clad Metals: Lukens Nickel-Clad, Lukens Inconel-Clad.

M

M 3 McDonald & Co., P. F., Boston.
Carbon Tool Steels: Macco Brand, Macco Certified, Macco Superior, Macco Swedish.
Special Alloy Tool Steels: Macco (Types Fool-Proof Chisel, Kromax, Royal Crown Oil Hardening, Chrome Tungsten, Swedish Vanadium, Hot Die, Air Hardening Trimmer Die).
High Speed Tool Steels: Macco Enormous, Maccomax, Macco Radio.

M 6 McInnes Steel Co., Corry, Pa.
Carbon Tool Steels: McInnes Special, Misco (Types "A" and "B"), Superior.
Special Alloy Tool Steels: (No. 4 Special Chrome Nickel, Vanadium Crucible.
High Speed Tool Steels: Record "A", "V" High Speed.
Non-Deforming Tool Steels: Cello Vanadium.
Brake Die Steel: McInnes Folder Die.

M14 Mackenzie's Sons Co., Duncan, Trenton, N. J.
Heat Resisting Alloy: Mackenite Metal.

M18 Mackintosh-Hemphill Co., Pittsburgh.
High Strength Alloy Steels: MacHempite Wearproofit.
Wear Resisting Steels: Adamite.
Wear Resisting Irons: Adamite, Iralite.

M21 Massillon Steel Casting Co., Massillon, O.
Alloy Cast Steel: Massillon, Tigerloy.
Nitrided Cast Steel: Nitralloy.

M22 Meehanite Metal Corp., Pittsburgh.
High strength sorbo-pearlite iron resistant to temperature, corrosion and wear: Meehanite.
Licensees: American Laundry Machinery Co., H. W. Butterworth & Sons; Banner Iron Works; Cooper Bessemer Corp.; Dayton Malleable Iron Co.; Farrel-Birmingham Co.; Florence Pipe & Foundry Co.; Fulton Foundry & Machine Co.; General Electric Co.; G. H. K. Foundry; Greenlee Foundry Co.; Hamilton Foundry & Machine Co.; Kanawha Mfg. Co.; Kinney Iron Works; Koehring Co.; Michigan Valve & Foundry Co.; Rosedale Foundry & Machine Co.; Ross-Meehan Foundries; Trenton Malleable Iron Works; Vulcan Foundry Co.; West Coast Meehanite Corp.; Warren Foundry & Pipe Co.; Wehrle Co.

M23 Mesta Machine Co., Pittsburgh.
Alloy Steel Castings: Mesta Special.

M28 Michigan Steel Casting Co., Detroit.
Heat and Corrosion Resisting Alloys: Misco (Types "B", "C", HN, "N",

18-8), Misco Metal, Miscrome (Types CR, KR, 1, 2, 3), Ni-Resist.

M35 Midvale Co., Nicetown, Philadelphia.
Carbon Tool Steels: Regular Carbon Tool, Special Carbon Tool, Extra Carbon Tool, Die Block, Smooth'ole, Hollow Drill, Mining Drill.
Special Alloy Tool Steels: Bit and Jar Steel, Bolt Die Regular, Bolt Die Special, Die Block C, Duredge Chisel, Finishing Regular, Finishing Special, Multole Punch, No. 77 Tool Steel, Nut Piercer, Salvo Rivet Set, Tool Holder.
High Speed Tool Steels: One Star, Three Star, Two Star.
Non-Deforming Tool Steels: Constant, Diamond Brand.
Corrosion and Heat Resisting Alloys: Midvaloy (Types Aerovalve, AMF, ATV-1, ATV-3, BTG, FC Stainless, HR-1, Hy-X, 13-00, 13-00 A, 17-00, 18-35 A, 18-08, 18-08 Se, 20-60, 21-00, 21-00 Cu, 25-10, 25-10 B, 25-20, 25-20 B, 26-02, 26-02 Z, 30-30, 976).

M39 Milne & Co., New York.
Carbon Tool Steels: Green Label, Orange Label, Red Label, White Label, Hollow Drill, Solid Drill, Spiral Drill.
Special Alloy Tool Steels: AO 20, MSM.
High Speed Tool Steels: AMC High Speed, HYCO High Speed.
Non-Deforming Tool Steels: AMCOH Oil Hardening.

M42 Milwaukee Steel Foundry Co., Milwaukee.
Nitrided Steel Castings: Nitralloy.

M49 Moltrup Steel Products Co., Beaver Falls, Pa.
Cold Drawn Steels: Moltrup.

M53 Monarch Steel Co., Indianapolis, Ind.
Cold Finished Steels: Speed Case.

N

N 7 National Alloy Steel Co., Blawnox, Pa.
Corrosion and Heat Resisting Castings: Na-1, Na-2, Na-4, Na-4M, Na-18, Na-19, Na-65.

N14 National Forge & Ordnance Co., Irvine, Warren County, Pa.
Corrosion and Heat Resisting Alloys: Nationalloy (Grades 1, 2 and 3).

N18 National Tube Co., Pittsburgh.
Seamless Tubing: National-Shelby.
High Strength Low Alloy Steel Pipe and Tubular Products: USS Cor-Ten, USS Man-Ten.

N21 Newport Rolling Mill Co., Newport, Ky.
Copper-Bearing Pure Iron: Gohi.
Copper-Bearing Steel: Kentucky.

N29 Nitralloy Corp., New York.
Controls Nitriding Process and Licenses Under Which Nitralloy is Produced. Licensees for Nitralloy Steel: Bethlehem Steel Co., Crucible Steel Co. of America, Firth-Sterling Steel Co., Ludlum Steel Co., Vanadium-Alloys Steel Co., Republic Steel Corp. Licensees for Nitralloy Steel Castings: Lebanon Steel Foundry, Empire Steel Castings Co., Massillon Steel Castings Co., Milwaukee Steel Foundry Co., Warman Steel Castings Co.

O

O 7 Ohio Steel Foundry Co., Springfield, O.
Corrosion and Heat Resisting Alloys: Fahrite (Types N-1, N-2, N-3, N-4, N-5, N-6).
Alloy Cast Steel: Hioloy.

P

P 3 Pacific Foundry Co., San Francisco.
Corrosion and Heat Resisting Castings: Corrosion, KA-2, KM1, KNC-3, Ni-Resist, Pyrocast.
Abrasive Resisting Castings: Flintcast.

P 5 Page Steel & Wire Division of American Chain Co., Monessen, Pa.
Stainless Steel Wire: Page Allegheny Stainless.

P 8 Paragon Steel & Tool Co., East Rutherford, N. J.
Carbon Tool Steels: Parasteel, Swedesteel.
Special Alloy Tool Steels: Parasteel, Swedesteel.
High Speed Tool Steels: Parasteel, Swedesteel.

P11 Peninsular Steel Co., Detroit.
Carbon Tool Steels: Blue Label, Cold Header Die, Penco Red Label.
Special Alloy Tool Steels: Bethlehem Fast Finishing, Bethlehem High Speed, Bethlehem Hot Work, Black Label Hollobar, Pen Van, Special No. 18.
Non-Deforming Tool Steels: Arrow Oil Hardening, Tri-Mo, White Label, Yellow Label.

P15 Pioneer Alloy Products Co., Cleveland.
Acid Resisting Ni-Cr-Mo Alloy: Pioneer.
Heat Resisting Cr-Ni-Mo Alloy: Pioneer.

P17 Pittsburgh Steel Co., Pittsburgh.
Seamless Pipe and Tubing: Pittsburgh Seamless.

P19 Pittsburgh Tool Steel Wire Co., Monaca, Pa.
Carbon Tool Steels: Dukane, Dukane Drill Rod, Monaca, Monaca Drill Rod, Monaca Special, Reliance, Reliance Drill Rod.
Special Alloy Tool Steel: Special Tungsten Alloy.
High Speed Tool Steel: High Speed.

P24 Potts Co., Horace T., Philadelphia.
Carbon Tool Steel: Trojan.
Machinery Steels: Elastuf Penn, Elastuf Media.
Alloy Steels, Heat Treated: Elastuf Type A, Elastuf Chro-Moly, Elastuf SAE 3140.
Alloy Steels, Untreated: Elastuf SAE 3140, Elastuf SAE 2335.
Abrasion Resisting Steels: Weartuf Plates, Elastuf Media Plates.

P29 Prentiss & Co., George W., Holyoke, Mass.
Nickel Chromium and Nickel Chromium Iron Resistance Alloys: Chromic (Types "A", "C", "D").

P33 Prosser & Son, Thomas, New York.
Carbon Tool Steel: Krupp Carbon.
Special Alloy Tool Steel: Krupp Special.
High Speed Tool Steel: Krupp High Speed.
Non-Deforming Tool Steel: Krupp Non-Deforming.
Cemented Carbides: Ti-Tex, Widia.

P39 Purdy Co., Inc., A. R., New York.
Carbon Tool Steels: Planet Choice, Planet Drill Rod, Planet Extra, Planet Regular, Planet Special, Purco Chisel.
High Speed Tool Steels: Planet High Speed, Planet Non-Shrinking, High Speed Planet X9 Tool Bits.
Alloy Steel: Planet Silico Manganese Spring Steel.

Q

Q 2 Q & C Co., New York.
Heat and Abrasion Resisting Alloy: Nogroth.

R

R 4 Reliance Steel Casting Co., Pittsburgh.
Alloy Steel Castings: Reliance.

R 7 Republic Steel Corp., Cleveland.
Carbon Tool Steels: Bourne-Fuller Tool, Extra, Extra Special, Standard.
Special Alloy Tool Steels: Air Hardening, Dumost, Velvet, XX Superior.
High Speed Tool Steels: Bourne-Fuller High Speed.
Non-Deforming Tool Steel: Arrestite.
Corrosion and Heat Resisting Alloys: Enduro.
High Strength Alloy Steels: Republic Double Strength Steel.
Copper-Bearing Iron: Toncan.
Alloy Steels: Agathon.

R18 Rustless Iron Corp. of America, Baltimore.
Rustless Chrome and Chrome Nickel Alloys: Defirust, Defirust-Machining, Rustless 15, Special Defirust, Defiheat, Defistain (Types Nos. 302, 304), Defistain-Machining, Special Defistain (Types Nos. 305, 306).

R23 Ryerson & Son, Inc., Joseph T., Chicago.
Tool Steels: Ryerson (Types B, F, D, Steel, Shock Steel, High Speed Steel, V. D. Steel.
Special Alloy Steels: Nikrome, Ryco, Rytense A. A.

S

S 4 Seneca Wire & Mfg. Co., Fostoria, O.
Iron and Steel Wire: Seneca.

S 7 Sharon Steel Hoop Co., Sharon, Pa.
Corrosion and Heat Resisting Alloys: Sharon Stainless (Types 12, 15, 16-6, 17, 18-8, 21, 27).

S11 Simonds Saw & Steel Co., Lockport, N. Y.
Carbon Tool Steels: Green Label, Diamond "S," Blue Label Extra, Red Label Special.
High Speed Steels: Red Streak, Super Cobalt.
Non-Deforming Steels: Teenax, O. H. D.
Magnet Steels: Permaflux, Chrome, Tungsten, Cobalt, Alnico.
Special Steels: Hi Nickel Alloys, Heat Resisting Alloys.

S14 Sivyer Steel Casting Co., Milwaukee.
Corrosion and Heat Resisting Castings: Sivyer (Types 60, 62, 64, 66, 67, 68, 70).
Alloy Cast Steels: Common, Medium Carbon, Hi Carbon, Special Carbon, Special Hi Carbon, Common Test Bar, Navy Test Bar, Manganese Nickel, Manganese Chrome, Manganese Vanadium, Special Carbon Chrome, Hi Carbon Chrome, Medium Chrome (A. C.), SAE (2315, 3115, 3135, 3140, 3240, 4140, 6140, 6145) Carbon Molybdenum, Chrome - Nickel - Moly, Hi Carbon Chrome Molybdenum, Miraculoy, 5% Chrome, 5% Chrome Moly, Dynamo, Pole, Hi Silicon, Carbon Vanadium, Hi Carbon Vanadium.

S18 S K F Steels Inc., New York.
Carbon Tool Steel: SKF 100.
Non-Deforming Steel: SKF 46.
Alloy Steels: SKF (Types 1, 3, 7, 9, 13, 22, 36, 711).

S21 Smith Steel Casting Co., George H., Milwaukee.
Alloy and Dynamo Steel Castings

S26 Standard Alloy Co., Inc., Cleveland.
Corrosion and Heat Resisting Alloys: Standard-Alloy AR1, Standard-Alloy HR (Types Nos. 1, 2, 3, 4, 5, 5M, 6, 6M, 7, 8, 9, 10, 11).

S29 Stanley Works, New Britain, Conn.
Corrosion and Heat Resisting Alloys: Stanley Grade A (Type No. 410), Stanley Grade B (Type No. 430), Stanley Grade C (Type No. 442), Stanley Grade D (Type No. 302), Stanley Grade E (Type No. 301).

S33 Stulz-Sickles Co., Newark, N. J.
Carbon Tool Steel: Seaco.

Special Alloy Tool Steels: Seaco Chrome Vanadium, Seaco Hot Die.
Non-Deforming Tool Steel: Seaco Non-Shrinkable.
11 to 13½% Nickel Manganese Steel: Manganal (patented).

S36 Superior Sheet Steel Co., Canton, O.
High Yield Point Low Alloy Steel: Konik Metal.
Corrosion Resisting Metal: Konik Metal.
Case Hardening Steel: Konik Metal.
Sheets: Superior Galvannealed, Superior Super Metal.

S39 Superior Steel Corp., Pittsburgh.
Corrosion and Heat Resisting Alloys: Silcrome Stainless Steels.

S47 Swedish Iron & Steel Corp., New York.
Carbon Tool Steels: Acorn Brand No. 1, Acorn Extra No. 2, Acorn Standard No. 3.
Special Alloy Tool Steels: Fedol Oil Hardening, Sisco Oil Hardening Octagon Chisel Steel.

T

T 4 Taylor-Wharton Iron & Steel Co., High Bridge, N. J.
Corrosion and Heat Resisting Alloys: Tisco (Types 101, 101A, 102, 102A, 103, 103A, 104, 104A, 105, 105A, 106, 106A, 107, 108, 109, 110, 130, 131, 132, 150, 160).
Alloy Cast Steel: Timang.

T 8 Tennessee Coal, Iron & Railroad Co., Birmingham.
Carbon Tool Steel: Tennessee Special.
Carbon Drill Steel: Tennessee Special.

T15 Timken Steel & Tube Co., Canton, O.
Corrosion and Heat Resisting Alloys: Timken Iron Chromium, Timken 18-8, Timken 18-8S.
Creep Resisting Alloy Steel: DM Steel, Sicromo.

U

U 3 Uddeholm Co. of America Inc., New York.
Carbon Tool Steels: UB Double Bolt hollow drill, UHB Cold Heading, UHB Regular, Triangle X Extra, Triangle X Special.
Special Alloy Tool Steels: UB Double Bolt Alloy hollow drill, UHB Regin (Cr-W) hot work steel, UHB Fingal (Cr-W-Mo) chisel steel, UHB Valand (Cr-Ni-W) hot work steel.
Non-Deforming Tool Steels: UHB-46 Oil Hardening, Tri-Mo Air Hardening.
Corrosion and Heat Resisting Alloys: UHB Stainless (Types Nos. 11, 12, 14, 15).

U 8 Union Drawn Steel Co., Massillon, O.
Cold Drawn Steels: Union Hymo Steel, Union Special Finish, Union Precision Shafting, Union McQuaid-Ehn Steel, Union Free Cut Bessemer, Union Supercut Screw Steel, Enduro Stainless Steels.

U12 Union Steel Casting Co., Pittsburgh.
Alloy Cast Steels: Univan.

U17 Universal Steel Co., Bridgeville, Pa.
Tool Steel: Supersteel, Mo Tung.
Corrosion and Heat Resisting Alloys: Uniloy.

V

V 5 Vanadium-Alloys Steel Co., Latrobe, Pa.
Carbon Tool Steels: Colonial No. 14, Red Star Die, Red Star Tap, Red Star Tool, Latrobe, Ideal.
Carbon Vanadium Tool Steels: Colonial No. 7, Vasco Special, Elvandi, Red Star Vanadium.
Special Alloy Tool Steels: Non-Shrinkable, Colonial No. 6, Red Star Tungsten, Crocar, Ohio Air Die, Marvel, Colonial No. 3, Choice, Hotform, Extrude Die.
Vasco Vanadium Types: D, G, H, K, N, BB, Colhed, Par-Exc, Tungo, Silman, CM, Croman, Nikro Trimmer, Beaver Die, Colona Die.
Non-Deforming Tool Steels: Non-Shrinkable, Colonial 6, Crocar, Ohio Air Die, Red Star Tungsten.
High Speed Tool Steels: Red Cut Superior, Red Cut Cobalt, E. V. M., Gray Cut Cobalt.
Corrosion and Heat Resisting Alloys: Stainless A, B, C-2, C-2F, F. M. S., I, N and U; Stainless 410, 410F, 610, 610F, 795.
High-Strength Alloy Steels: Vanadium (Types D and G), Colona Die, Beaver Die, Nikro-Trimmer.

V 9 Vulcan Crucible Steel Co., Aliquippa, Pa.
Carbon Tool Steels: Extra, Fort Pitt, Special.
Special Alloy Tool Steels: Calo Ferro, Extra Chrome, Hecla, Hi-Pro, KR, Non-Hardening, Regal No. 2, Special Van.
High Speed Tool Steels: Super Steel, Wolfram High Speed.
Non-Deforming Tool Steel: Hardrite Non-Shrinkable.
Corrosion Resisting Alloy: Stainless Steel Type A.

W

W 4 Ward's Sons Co., Edgar T., Newark, N. J.
Carbon Tool Steels: Blue Label, Green Label, Red Label, Standard.
Special Alloy Tool Steels: Extra Best Cast, Self-Hardening, Special No. 0.
High Speed Tool Steels: Gold Label.
Non-Deforming Tool Steel: Teenax.

W 6 Warman Steel Casting Co., Los Angeles.
Corrosion and Heat Resisting Castings: Warman (Types 5, 5M), Warman Calduro (Types 13, 13-2), Warman Calmar (Types 18-8, 18-8 Mo), Warman Caloxo (Types 8-8, 15-25, 15-25M, 15-35, 18, 18-2, 25-20, 25-20M, 26, 26-4, 28-10, 28-10M).

W 9 Washington Iron Works, Seattle, Wash.
High Strength Alloy Steel: Superloy.

W14 Webb Wire Works, New Brunswick, N. J.
Corrosion and Heat Resisting Alloys: Ship Brand Blue Label, Ship Brand Orange Label, Ship Brand Red Label.

W17 Weirton Steel Co., Weirton, W. Va.
Cold Process Tin Mill Products: Weirite.

W19 West Leechburg Steel Co., Pittsburgh.
Hot and Cold Rolled Strip Steel: Wisco.
Stainless Steel Strip Steel: Allegheny Stainless.

W20 West Steel Casting Co., Cleveland.
Alloy Cast Steel: Duralloy.

W25 Wheeling Steel Corp., Wheeling, W. Va.
Copper-Alloyed Steel: Cop-R-Loy.
Cold Reduced Tin Plate: Ductillite Tin Plate.
Normalized Tin Plate: Wheeling Coke Tin Plate.

W28 Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Carbon Tool Steels: Whelco Standard, Whelco Superior.
Special Alloy Tool Steels: Whelco Alloy Tap, Whelco Finishing, Whelco Hot Die.
High Speed Tool Steel: Whelco High Speed.
Non-Deforming Tool Steel: Whelco Oil Hardening.
Machinery Steels: Economo, Hy-Ten.
Corrosion and Heat Resisting Alloys: Whelco (Types A, B, and Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9).

W33 Wickwire Spencer Steel Co., New York.
Corrosion and Heat Resisting Alloys: Wissco Stainless (Types No. 1, 1M, 2, 3, 4, 4M, 4S, 5A, 5CN).

W39 Wood Steel Co., Alan, Conshohocken, Pa.
High Strength Low Alloy Steel: "A. W."-"70-90."

W44 Worth Steel Co., Claymont, Del.
Steel Plates: Worth.

W51 Wyckoff Drawn Steel Co., Pittsburgh.
Cold Finished Steels: Wyckoff.
Cold Finished Manganese Steels: Wyckoff Controlled Manganese.

Y

Y 4 Youngstown Sheet & Tube Co., Youngstown, O.
High Strength Alloy Steel: Yoloy.
Normalized Tin Plate: Youngstown Pliaduc.
Cold Reduced Tin Plate: Youngstown Cold Reduced.

Z

Z 3 Ziv Steel & Wire Co., Chicago.
Carbon Tool Steels: Hollow Drill, Rolled Auger Solid Drill, Zivco, Ziv's.
Special Alloy Tool Steels: Lophos, Van-DieCar, Wizard, Plancher, Do-It.
High Speed Tool Steels: Cobalt, Red Shadow, Super, Zip, BRM.
Non-Deforming Tool Steels: Neor, PRK 33, Hargus, Normar.
Tantalum Carbide: Straus Metal.

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Broad Strip Mills Feature 1935 Expansion

About 2,000,000 Tons Added to Annual Stripmaking Capacity by Completion of Four Continuous Units Embodying in Their Design and Construction Every Proven Device for Controlling the Metal While in Transit from One End of the Mill to the Other

EXPENDITURES for new capacity in the iron and steel industry last year were applied to a large extent to finishing mills and as a result, 1935 perhaps will be remembered as a year in which more broad strip mills started initial production than in any year since their inception—mills which cost in excess of $10,000,000 each. In this country alone there are 20 such mills either in operation or under construction with a combined capacity of over 10,000,000 tons. Some of these units have delivered either to the coilers or over the hot bed more than 3000 tons of strip in 24 hours; but a few years ago operators of these mills considered 1800 tons a record day's run.

Four broad strip mills of the continuous type and a 2-high hot mill of the Steckel type were completed last year. The 79-inch broad strip mill of the Youngstown Sheet & Tube Co., Campbell, O., was the first of the 1935 units to swing into production. Outside of a slight change in the layout and driving mediums, the new mill is practically the same as other modern broad strip mills. But there is this exception. A factor of safety has been incorporated in the mill which is considerably in excess of other hot strip mills in this country.

Wide Cold Mill Is Unique

Then, too, the cold strip department serving the Youngstown mill is equipped with a stand of 93-inch cold rolls—said to be the widest mill for cold strip reduction in this or any other country. The mill is unique in that it is the only one of its type deliberately designed for producing cold rolled sheets in excess of hot strip widths available. This, of course, is accomplished by cross rolling.

A description of the continuous hot strip mill of the Youngstown Sheet & Tube Co. was presented in the April 29, 1935, issue of STEEL.

The second continuous broad strip mill to be completed in 1935 was that of the Ford Motor Co., Dearborn, Mich. This is a 56-inch unit.

The largest portion of the tonnage coming off the mill will be delivered in coils for in this form the strip will be fabricated into various automobile parts as fast as the presses throughout the plant can be changed over to work coils instead of flats.

A major factor in gage variation in modern roller bearing equipped mills is the variation of temperature between the front and rear end of the strip as it passes through the finishing train of rolls. To correct this, however, and at the same time to increase the output the mill of the Ford Motor Co. has been equipped with a high-velocity cooling system in connection with the table between the roughing and finishing trains.

This air table is built in sections; special nozzles for the air jets are installed above and below the table for a distance of about 100 feet. When repairs on the table are necessary, the top structure can be removed easily. As the strip advances toward the finishing mill the air jets are operated automatically and in sequence, the length of time being controlled by present time relays. Ordinarily, a difference in temperature of as much as 150 degrees Fahr. might exist between the front and rear end of a strip entering the first finishing stand, but under the new automatically controlled air cooling system, all sections of the strip will be at the same temperature as they enter the first finishing pass. As a result of this arrangement there will be no delay in handling even the heaviest material rolled, the strip advancing constantly.

Another feature of the Ford mill is the lengths of strip handled in the cold rolling department. Two coils are joined together by welding and thus are cold rolled in double lengths both on the reversing and tandem cold mills. By this arrangement the cost of cold rolling has been reduced about 50 per cent.

A description of the modern wide strip mill of the Ford Motor Co. was presented in the Dec. 16, 1935 issue of STEEL.

The third broad strip mill placed in initial operation during 1935 was the 42-inch unit of the Carnegie-Illinois Steel Corp., McDonald, O. The mill, which is designed to roll up to 37 inches wide and in thicknesses ranging from 18 gage to ⅜-inch, has a capacity of 30,000 tons per month. A description of this unit was presented in the Dec. 30, 1935, issue of STEEL.

The fourth continuous broad strip mill laid down last year was the 79-inch mill of the Bethlehem Steel Co., Lackawanna, N. Y. The accompanying table, entitled "Rolling Mills Completed in 1935," shows the number of cold mills which will serve this installation.

Completes Reversing Hot Mill

The McLouth Steel Corp., Detroit, started its new hot Steckel-type reversing strip mill early in 1935—the first mill of its kind in this cointry to be scheduled entirely on strip specifications. The mill is built with two elevated holding furnaces, one spanning the approach and one the runout table. As the front end of the strip emerges from the rolls it is directed into the holding furnace where it is reeled into a coil while reduction of the remaining part of the section continues. When the rolls are reversed conditions on the opposite side of the mill are duplicated.

The 3-high breakdown mill continues to be looked upon with favor by the sheet industry. Six of these mills were installed last year. In a mill of this type the top and middle rolls are counterbalanced, the top roll being driven through pinions.

Two new batteries of by-product coke ovens were placed under construction last year and the order is reported to be the largest coke oven order in the United States in over seven years. The ovens are being added to the compliment of the Ford Motor Co., Dearborn, Mich. No new steelmaking furnaces were added last year although it is understood contracts soon will be let for the construction of two 100-ton units at a

Table I

Recapitulation

	Completed 1935	Building 1935
Open-hearth furnaces	1	0
Stacks remodeled	1	3
By-product coke ovens	37	122
Rolling mills:		
Billet	0	2
Blooming	2	1
Breakdown, 3-high	6	0
Edging	1	0
Plate, 4-high	0	1
Rod	0	4
Roughing	0	2
Strip, 2-high hot	2	0
Strip, 2-high cold	6	2
Strip, 4-high hot	4	4
Strip, 4-high cold	14	11
Strip, tandem	4	4
Tube, electric	0	2
Total	39	33

plant in the Great Lakes district.

Progress of construction completed or now in the process of completion by various companies follow:

United States Steel Corp.

AMERICAN SHEET & TIN PLATE CO.

Completed

Gary Sheet Works: Continuous pickling equipment for hot rolled strip, including new building.

Gary Tin Works: Additional slab heating furnace and improvements to continuous roughing mill.

Underway

Gary Sheet Works: Continuous 4-high hot strip mill, with slab furnaces and other auxiliary equipment. Two 4-high tempering mills, with additional annealing, pickling, shearing, and shipping facilities. 3-stand tandem 4-high cold reduction mill, with processing and shipping facilities.

Gary Tin Works: 5-stand tandem cold reduction mill, with processing and shipping facilities.

CARNEGIE-ILLINOIS STEEL CORP.

Underway

Duquesne Works: New switch house and modernizing switching equipment. Wiring at electric power station.

Homestead Works: 100-inch semi-continuous sheared plate mill, with 4-high finishing stands and auxiliary handling, shearing and plate finishing facilities.

Ohio Works: New boiler plant of 4 gas-fired boilers of 1850 horsepower each.

Completed

Gary Works: Converted 28-inch 2-high strip mill into a 36-inch 4-high strip mill, including additions to and improving auxiliary facilities.

AMERICAN STEEL & WIRE CO.

Underway

Joliet Works: Two additional rod mills with auxiliary facilities, also rod cleaning equipment at Waukegan works and continuous wire drawing facilities in plants throughout Chicago district.

Youngstown Sheet & Tube Co.

BRIER HILL WORKS

Completed

Stamping Plant: A complete stamping plant, with presses, machine and die shop, and auxiliaries; known as the Youngstown Metal Products Co.

Underway

Tube Mill: Additional equipment

Equipment Completed and Building in 1935

Table II

Open Hearths Completed in 1935

Company	Number of furnaces	Rated capacity, tons	Annual capacity, tons
Laclede Steel Co., Alton, Ill.	*1	100	70,000
Mesta Machine Co., W. Homestead, Pa.	1	50	35,000
Total	1		35,000

*Replaces 85-ton furnace.

Table III

Stacks Remodeled in 1935

Company	Number or name
Ford Motor Co., Dearborn, Mich.	"B"

Table IV

Stacks Being Remodeled Dec. 31, 1935

Company	Number or name
Bethlehem Steel Co., Sparrows Point, Md.	"D"
Carnegie-Illinois Steel Corp., Braddock, Pa.	"I"
Youngstown Sheet & Tube Co., Campbell, O.	"B"
Total	3

Table V

By-Product Ovens Completed in 1935

Company	No. of ovens	Type of ovens	Est. annual coking capacity, tons
Public Serv. Elec. & Gas Co., Camden, N. J.	37	K-B	233,100

Type of Ovens: K-B, Koppers-Becker

Table VI

Ovens Building Dec. 31, 1935

Company	No. of ovens	Type of ovens	Est. annual coking capacity, tons
Carnegie-Illinois Steel Corp., Gary, Ind.	*138	K-B	1,021,200
Columbia Steel Co., Provo, Utah	*33	K-B	207,900
Ford Motor Co., Dearborn, Mich.	122	K-B	768,600
Total	122		768,600

*Replacement

Table VII

Rolling Mills Completed in 1935

Company	No. mills	Type mills
Bethlehem Steel Co., Lackawanna, N. Y.	1	79" 4-high hot strip
Bethlehem Steel Co., Lackawanna, N. Y.	1	75" tandem cold strip
Bethlehem Steel Co., Lackawanna, N. Y.	2	75" 4-high coil strip
Bethlehem Steel Co., Lackawanna, N. Y.	1	90" 4-high cold strip
Bethlehem Steel Co., Lackawanna, N. Y.	1	54" tandem cold strip
Bethlehem Steel Co., Lackawanna, N. Y.	1	54" 2-high cold strip
Bethlehem Steel Co., Sparrows Point, Md.	††1	8" bar
Bethlehem Steel Co., Sparrows Point, Md.	1	3-high breakd'n
Carnegie-Illinois Steel Corp., Gary, Ind.	†1	36" 4-high hot strip
Carnegie-Illinois Steel Corp., McDonald, O.	1	42" 4-high hot strip
Cold Metal Process Co., Youngstown, O.	*1	26" 4-high cold strip
Cold Metal Process Co., Youngstown, O.	*1	74½" 4-high cold strip
Crucible Steel Co. of America, Jersey City, N. J.	*1	84½" 4-high cold strip
Detroit Steel Corp., Detroit, Mich.	*1	24" 4-high cold strip
Disston & Sons Inc., Henry, Philadelphia	2	6" 2-high cold strip
Ford Motor Co., Dearborn, Mich.	1	44" blooming
Ford Motor Co., Dearborn, Mich.	1	56" 4-high hot strip
Ford Motor Co., Dearborn, Mich.	*1	84" 4-high cold strip
Ford Motor Co., Dearborn, Mich.	1	56" tandem cold strip
Ford Motor Co., Dearborn, Mich.	2	56" 2-high cold strip
Inland Steel Co., Indiana Harbor, Ind.	†1	44" blooming
McLouth Steel Corp., Detroit	*1	15" 2-high hot strip
Niles Rolling Mill Co., Niles, O.	1	3-high breakd'n.
Republic Steel Corp., Warren, O.	1	42" 4-high cold strip
Republic Steel Corp., Warren, O.	2	3-high breakd'n.
Republic Steel Corp., Canton, O.	1	52" 3-high breakd'n.
Republic Steel Corp., Canton, O.	1	72" 3-high breakd'n.
Republic Steel Corp., Youngstown, O.	1	edging
Rotary Electric Steel Co., Detroit	†1	28" roughing
Thomas Steel Co., Warren, O.	1	24" 4-high cold strip
Thomas Steel Co., Warren, O.	*1	84½" 4-high cold strip
Washburn Wire Co., Phillipsdale, R. I.	1	34" blooming
Washburn Wire Co., Phillipsdale, R. I.	1	12" hot strip
West Leechburg Steel Co., Leechburg, Pa.	*1	20" 4-high cold strip
Youngstown Sheet & Tube Co., Campbell, O.	1	79" 4-high hot strip
Youngstown Sheet & Tube Co., Campbell, O.	1	76" tandem cold strip
Youngstown Sheet & Tube Co., Campbell, O.	1	76" 4-high cold strip
Youngstown Sheet & Tube Co., Campbell, O.	1	93" 4-high cold strip
Youngstown Sheet & Tube Co., Campbell, O.	1	54" 2-high cold strip
Total	39	

*Reversing
†Replacement
††Relocated

Table VIII

Rolling Mills Building, Dec. 31, 1935

Company	No. mills	Type mills
American Rolling Mill Co., Middletown, O.	*1	80" 4-high hot strip
American Rolling Mill Co., Middletown, O.	3	80" 4-high cold strip
American Sheet & Tin Plate Co., Gary, Ind.	1	80" 4-high hot strip
American Sheet & Tin Plate Co., Gary, Ind.	2	4-high cold strip
American Sheet & Tin Plate Co., Gary, Ind.	1	tandem cold strip
American Sheet & Tin Plate Co., Gary, Ind.	1	tandem cold strip
American Steel & Wire Co., Joliet, Ill.	2	rod
Bethlehem Steel Co., Sparrows Point, Md.	1	42" tandem cold strip
Bethlehem Steel Co., Sparrows Point, Md.	2	42" 4-high cold strip
Carnegie-Illinois Steel Corp., Homestead, Pa.	1	100" 4-high plate
Continental Steel Corp., Kokomo, Ind.	**1	19" cont. sheet bar
Granite City Steel Co., Granite City, Ill.	1	90" 4-high hot strip
Granite City Steel Co., Granite City, Ill.	1	48" 4-high cold strip
Great Lakes Steel Corp., Detroit	1	90" 4-high hot strip
Great Lakes Steel Corp., Detroit	1	84" 4-high cold strip
Great Lakes Steel Corp., Detroit	1	76" tandem cold strip
Great Lakes Steel Corp., Detroit	1	54" 2-high cold strip
Great Lakes Steel Corp., Detroit	1	76" 4-high cold strip
Greer Steel Co., Anderson, Ind.	***1	4-high cold strip
Jones & Laughlin Steel Corp., Pittsburgh	1	44" blooming
Jones & Laughlin Steel Corp., Pittsburgh	**	21" billet
Jones & Laughlin Steel Corp., Pittsburgh	***1	4-high hot strip
Laclede Steel Co., Alton, Ill.	1	10" rod
Northwestern Barbed Wire Co., Sterling, Ill.	1	10" rod
Northwestern Barbed Wire Co., Sterling, Ill.	*2	18" roughing
Steel & Tubes, Inc., Elyria, O.	1	electric tube
Wallingford Steel Co., Wallingford, Conn.	1	29" 4-high cold strip
Youngstown Sheet & Tube Co., Campbell, O.	1	54" 2-high cold strip
Youngstown Sheet & Tube Co., Campbell, O.	1	electric tube
Total	33	

*Single stand
**Rebuilding
***Authorized

to present electric weld tube mill for producing 6⅝ to 16-inch pipe by the resistance method.

CAMPBELL WORKS

Completed

Skelp Mills: Moved No. 1 skelp mill, including furnaces, to make room for hot strip mill.

Strip Mills: A complete 79-inch hot strip mill, finishing equipment for handling coiled strip, sheared breakdowns, and plate finishing equipment consisting of levelers, shears, trimmers, normalizing, pickling equipment, etc.

A complete cold strip mill consisting of a continuous pickler, one 3-stand 4-high tandem cold mill, two single stands 4-high mills, one single stand 2-high mill, shears levelers, pilers, trimmers, and annealing equipment.

Sheet Mills: Changes and additions necessary for rolling sheets from hot strip breakdowns.

General: Equipment installed for up-to-date checking and inspection of pipe threads, and tap and die steels. Relocation of general machine shop.

Underway

Strip Mills: A second continuous pickle line for the cold strip mill. A second 2-high 54-inch skin pass mill equipped to handle coils. A third slab heating furnace with tables before and after in the hot mill. Spare pump and filters for roll cooling water.

STRUTHERS WORKS

Completed

Rod and Wire: Butt welding equipment for welding coils together. A gas generator for wire normalizing furnaces. An up-to-date tensile testing machine.

Underway

Struthers Works: A small electric tube plant for producing light-walled conduit and mechanical tubing.

INDIANA HARBOR WORKS

Completed

Blooming Mill: Slow cooling pits for alloy steel, and enclosing portion of slab yard.

Merchant Mills: Chipping machine with skids and tables for handling billets to and from machine. Slow cooling pits to handle alloy product. Over and under-firing for No. 3 billet heating furnace. Automatic straightener, cut-off machine, and gag presses for rounds and other shapes. Reversing drive and screwdown for No. 1 stand of the 18-inch mill.

General: Wash and locker rooms at various central points. Hack saw equipment for rolling mills for handling alloy steel.

Underway

Tin Mill: Extension to Laboratory and special testing equipment.

Completed

South Chicago Works: Changed molds on one pig machine for making smaller pigs.

Republic Steel Corp.

Completed

Youngstown District: Stokers have been installed in a boiler house at bessemer plant for utilizing coke breeze.

Finishing end of No. 2 electric weld tube mill rearranged. A building extension, 75 x 425 feet, constructed and new threading and cut-off equipment installed for production of high-grade casing.

Plate mill is being revamped; new tilting tables being installed; and new direct-current motor drive with the necessary motor-generator set is being provided to replace original steam drive. Arrangements are being made to discontinue the generation of 25-cycle power and change over all 25-cycle equipment to 60 cycle.

Warren District: Powdered coal equipment installed on two boilers in blast furnace boiler house at Trumbull-Cliffs furnace.

A 4-high reversing cold mill with necessary auxiliary cold finishing equipment, including electric cleaning system, flying shears, and skin rolling mill, has been installed.

An additional terne pot with its auxiliary equipment added.

Two 3-high breakdown mills installed in the tin department. Several finishing mills modernized by installation of feeder and catcher tables and continuous heating furnaces.

An additional silicon strip annealing furnace being installed.

Central Alloy District: A hydraulic descaling system installed on the 12-inch mill at Canton, O.

Two additional carriage-type annealing furnaces built in heat treat department.

Terne pot equipment at Stark sheet division being modernized.

Improvements made to Stark sheet mills: Two modern 3-high roughing mills with continuous heating furnace and modern handling equipment installed; four existing 2-high finishing stands equipped with continuous furnaces and mechanical feeders and catchers; new pack shearing and pickling equipment installed; and ad-

Buffalo District: An electric precipitator for cleaning blast furnace gas with necessary gas distributing system has been installed.

A hydraulic descaling system for 8, 10, and 14-inch merchant mills completed.

A Dorr sludge thickener and filter installed.

Chicago District: Hydraulic descaling equipment installed on merchant mills.

A 198-foot extension to present 12-inch mill building completed.

Blooming mill being revamped. An electric drive is replacing original steam drive.

Birmingham District: Improvements have been made to the coal washery plant.

Sinter plant, including necessary building, conveyors, and miscellaneous equipment being installed.

Slag granulating plant being installed.

Upson Nut Division: New bolt making and wire drawing equipment installed.

Steel and Tubes, Inc.: Additional building space, an annealing furnace, and miscellaneous equipment installed for production of electrically-welded boiler tubes at Cleveland.

An addition to stamping plant at Elyria, O. constructed.

A new Johnson electric tube welder being installed at the Elyria division.

Berger Mfg. Co.: New sheet forming and welding equipment installed.

Canton Culvert Association: Equipment for coating corrugated metal culverts with bituminous coating being added.

Bethlehem Steel Co.

Completed

Bethlehem Plant: Three waste-heat boilers on gas engines at power house; a welfare building at merchant bar mills.

Cambria Plant: Electric motor drive for rod mill; one annealing and normalizing furnace for bright wire; one 2-cell unit for Bethanizing of wire at rod and wire department; new welding shop for car building department.

Lackawanna Plant: A complete new sheet, strip and plate department consisting of one 4-high continuous mill of one stand of 36 & 49 x 96-inch rolls and nine stands of 20 & 49 x 79-inch rolls, one 4-high tandem cold reducing mill of three stands of 20 & 49 x 75-inch rolls, one 4-high cold reducing mill of three stands of 20 & 49 x 54-inch rolls, two 4-high cold reducing mills each of one stand of 20 & 49 x 75-inch rolls, one 4-high cold reducing mill of one stand of 20 & 49 x 90-inch rolls, one 2-high cold finishing mill of one stand of 27 x 54-inch rolls, and all necessary buildings, cranes, heating, normalizing and annealing furnaces, pickling units, and other finishing and handling equipment required for their operation;

Table IX

Blast Furnaces Dismantled in 1935

Company	Name of stack
American Steel & Wire Co., Cleveland	"A" and "C"
Carnegie Steel Co., New Castle, Pa.	Nos. 2, 3 and 4
Cranberry Furnace Co., Johnson City, Tenn.	Cranberry
Davison Coke & Iron Co., Leetonia, O.	Cherry Valley
Lavino Furnace Co., Marietta, Pa.	Vesta
Star Furnace Co., Jackson, O.	Star
Stewart Furnace Co., Sharon, Pa.	Stewart
Tennessee Coal, Iron & R. R. Co., Bessemer, Ala.	Nos. 2 and 4
U. S. Pipe & Foundry Co., Scottdale, Pa.	No. 1
Total	13

equipment for controlled cooling of rails at rail mill.

Maryland Plant: One gas disintegrater, moisture eliminator and gas main for clean blast furnace gas; bar finishing building and warehouse; one continuous furnace and 3-high roughing mill at sheet mills; patenting furnace at wire mills.

Steelton Plant: Equipment for controlled cooling of rails at rail mill.

Underway

Cambria Plant: Coal pulverizing equipment for steam station at blast furnace department; waste-heat boilers and forced draft fans for three open-hearth furnaces; motor drive for axle mill.

Maryland Plant: Addition to tin plate department consisting of one 4-high continuous reducing mill of five stands of 18 & 49 x 42-inch rolls, two 4-high skin pass mills each of one stand of 18 & 49 x 42-inch rolls, and all necessary buildings, cranes, annealing furnaces, cleaning pickling and handling equipment; turboblower for blast furnaces; new blast furnace "D" replacing former "D" furnace; gas cleaning and distributing system for clean blast furnace gas; and 8-inch bar mill including buildings and equipment.

Pacific Coast Plants: Warehouse at Seattle for steel products. Addition to San Francisco warehouse for steel products.

Miscellaneous Completed

Laclede Steel Co.: Open hearth has completed a new mold yard and is

replacing an 85-ton open hearth with a new 100-ton Stevens furnace. Adding a 10-inch 8-stand continuous rod mill to existing 12 and 10-inch continuous mill; six wire drawing blocks; wire galvanizing, tinning and lead annealing equipment; pot type annealing furnace. Adding new soaking pit. Additions to machine shop: pickling department and warehouse, craneway and building extensions. New machine tools in Alton and Madison shops. Central generating system for oxygen and acetylene at Alton.

Jones & Laughlin Steel Corp.: Under construction at South Side plant a 44-inch blooming mill and two additional 21-inch billet mill stands to replace present equipment; also there is being installed an extension to the 4-high cold reducing mill at Aliquippa works. These installations will be completed in January 1936. A broad hot and cold strip mill has been authorized. In addition to foregoing, there has been purchased through the wholly owned subsidiary company, Jones & Laughlin Steel Service, Inc., the fabricating shop, warehouse and business of the National Bridge Works, Long Island City, N. Y.

Central Iron & Steel Co.: Two additional open hearth furnaces equipped with automatic reversal and roof temperature controls. Three open-hearth furnaces completely insulated. A cold process lime and soda ash water softener having a capacity of 6000 gallons per hour installed and connected with waste-heat boilers in open-hearth department. A 150-ton hydraulic sectional flanging machine and an additional punch were installed in the flanging plant. Construction for 1936 will include a new steel building to serve as a warehouse for finished plates and a high-pressure boiler plant and an electric power generating station.

Michigan Seamless Tube Co.: Installed two 2½-inch tube reducing machinese, new machine shop, 60 x 120 feet, new loading dock and track and built a 6000-square foot addition to the main office building.

Keystone Steel & Wire Co.: Rod storage building added.

Jessop Steel Co.: Installing one Heroult-type electric furnace with a capacity of 70,000 pounds per 24 hours and two car-type annealing furnaces of 20,000 pounds capacity.

Henry Disston & Sons Inc.: Installed two 6-inch cold strip mills, an annealing furnace, and experimental induction melting furnace, new billet chipping and grinding department, new roll grinding and turning department and two annealing furnaces.

Interlake Iron Corp.: Relined 300-ton stack at Duluth, Minn.

Reading Iron Co.: Installed ten 250-horsepower boilers at Danville, Pa. bar mills.

Wheeling Steel Corp.: Installed 11 tube-type box annealing furnaces and one normalizing furnace for sheets. Under construction are certain additions to buildings and facilities for more efficient handling and processing of hot and cold strip at the Steubenville, O. division.

Empire Sheet & Tin Plate Co.: Three-pot tinning equipment with a capacity of 400,000 base boxes annually is now being installed.

Wisconsin Steel Co.: No. 2 merchant mill now being modernized and a turbo blower installed at the blast furnace department.

Eastern Rolling Mill Co.: Major plant additions include two automatic catchers for hot mills, two vertical tube-type annealing units and a traveling crane for the shipping department.

Simonds Saw & Steel Co.: Installed two high-frequency electric furnaces of 50 and 100 pounds capacity, for pouring small castings. A 100-pound unit will be installed in 1936.

Northwestern Barbed Wire Co.: Top-charged electric furnace now being installed.

New Equipment Introduced in 1935

Ajax Electrothermic Corp.
Trenton, N. J.
Converter, 3-kilowatt capacity; Electric induction furnace, 2-pound capacity; Electric induction furnace, 4-pound capacity.

Alliance Machine Co., Alliance, O.
Pipe pickling machine; Stripper head for adapting standard strippers to a combination stripper and extractor; New type drip-proof bronze bearing; New type soaking pit crane; New type bridge drive for cranes; New type forge manipulator.

American Gas Furnace Co.
Elizabeth, N. J.
Tool room oven furnace; Oven furnace for general heat treating; Oven-fired, bottom vented oven furnace; Reciprocating full muffle heating machine; Continuous rotary carburizing machine; Bell-type retort furnace; Strip steel hardening furnace equipment.

Atlas Car & Mfg. Co., Cleveland.
Hydraulic car pushers for continuous kilns and driers; Storage battery operated industrial lifting trucks; Annealing oven bottom car of welded steel construction; Indicating dial scale equipped for automatic control of weighing functions; Junior indicating dial scale; Heavy-duty electric car pusher locomotives; All-steel welded trailers and floor trucks; Hand-operated battery changing station.

Bailey Co., W. M., Pittsburgh.
Totally enclosed goggle valve; Open-hearth checker brick.

Brassert & Co., H. A., Chicago.
Improved Brassert hot blast stove; Brassert all-metal rolled-hot blast stove bottoms; Cast iron and cast steel hot blast stove bottoms; Brassert automatic electric mud gun; Brassert cyclonic spiral tile gas washers; Brassert ring wedge goggle valve; Leaf type hot blast stove burner; Brick lined vortex collectors; Dust conditioning conveyor; Disintegrators for manganese gas; Improved coke eliminators for gas cleaning systems; Brassert automatic self-cleaning strainers; Glazed porcelain straining disks having 1/16, 1/32, 1/64, and 1/100-inch diameter; Henry-Butler heavy nosed tuyeres; Vibrating coke screen and feeder; Vibrating bin bottom.

Continental Roll & Steel Foundry Co., East Chicago, Ind.
Bell-type annealing furnace.

Cooper-Bessemer Corp. Mt. Vernon, O.
Diesel engine.

Crane Co., Chicago.
Solder joint valves; Brass globe and angle valves with plug type disk; Malleable iron globe and angle valves with plug type disk.

Detroit Electric Furnace Co., Detroit.
Laboratory melting furnace; Automatic rocking control; Water-cooled port sleeves; Water-cooled door frame; Limit switch and magnetic brake motor assembly; Convection air heater; Weld stress reliever for pipe pressure piping.

Dravo-Doyle Co., Pittsburgh.
Direct-fired unit heater.

Electric Furnace Co., Salem, O.
Continuous bright annealing tube furnace; Pit furnace for bright annealing wire, and normalizing and spheroidizing rods; Continuous brazing furnace; Continuous scale-free heat treating furnace; Roller hearth furnace.

Fate-Root-Heath Co., Plymouth, O.
Butane-electric switching locomotive.

Hagan Corp., Pittsburgh.
Draft regulation for open-hearth and heating furnace; Roof temperature regulation; Constant air and gas pressure regulation; Gas mixing stations; Fuel-air ratio control; Regulation of air supply.

Hevi Duty Electric Co., Milwaukee.
Chromium-iron-aluminum alloy.

Homestead Valve Mfg. Co., Inc., Coraopolis, Pa.
Vapor spray cleaning machine; Chemical vapor spray cleaning machine; Improved hydraulic stop valves; Triplex metering pump.

McKee & Co., Arthur C., Cleveland.
Large bell operating mechanism; McKee valve for hot gas mains; Superimposed gas washer; Improved stove checker tile.

Mathews Conveyer Co., Ellwood City, Pa.
Coil upenders; Coil tilting tables; Roller tables; Roll out tables; Vertical roller curves; Power turntables; Power curves; Herringbone furnace runout table.

Michigan Steel Casting Co., Detroit.
Centrifugal cast products for normalizing, heat treating and annealing furnaces, radiant heater tubes, blast furnace blowpipes, etc.

Morgan Engineering Co., Alliance, O.
44" blooming mill manipulator of welded construction.

Pittsburgh Lectromelt Furnace Corp., Pittsburgh.
Top charge electric furnace.

Surface Combustion Corp., Toledo, O.
Radiant tube annealing covers. Radiant tube heat treating furnaces; Improved unit heaters (gas-fired); Mast-type continuous lead and cyanide hardening units; Gas preparation machines for bright annealing; Gas preparation machines for high-carbon steel; Air draw furnace; Improved soaking pits; Improved draw furnaces; Eutectrol gas carburizing (continuous); Eutectrol gas carburizing (batch); Light case carburizing units; Improved air heaters.

Wellman Engineering Co., Cleveland.
Automatic mechanical gas producer.

Table X

Dismantled During 1935

American Sheet & Tin Plate Co., Farrell, Pa.
12 hot sheet mills
11 cold sheet mills

American Steel & Wire Co., Newburgh, O.
7 60-ton open-hearth furnaces
2 15-ton bessemer converters

Carnegie-Illinois Steel Corp., New Castle, Pa.
2 12-ton bessemer converters
1 36-inch blooming mill
2 24-inch sheet bar mills

American Sheet & Tin Plate Co., Wellsville, O.
10 hot sheet mills
16 cold sheet mills

National Tube Co., Pittsburgh
6 lapweld mills (Pennsylvania dept.)
Coupling shop (Republic dept.)

West Leechburg Steel Co., Leechburg, Pa.
1 12-inch hot strip

1935 Sets High Mark in Equipment Progress

This Extensive Cross Section of Machinery and Appliance Development During the Past Year, Compiled by the Editors of STEEL, Is Impressive Testimony of Manufacturers' Efforts To Supply the Metalworking Industry with the Best in Modern Production Tools

Abrasive Machine Tool Co., East Providence, R. I.
Surface grinder.

Acme Electric & Mfg. Co., Cleveland.
Voltage regulator.

Acme Machine Products Co. Inc., Muncie, Ind.
Sure flow pumps.

Acme Machine Tool Co., Cincinnati.
Nos. 4-R and 5-R ram type turret machines having 1½ and 2½-inch bar capacity, respectively.

J. D. Adams Co., Indianapolis.
Vertical arc welder; Engine-driven arc welder.

Adlet Mfg. Co., Cleveland.
Conduit fittings.

Adjustable Clamp Co., Chicago.
Miniature C-clamps.

Adolph Muehlmatt, Cincinnati.
Super sensitive drilling machine.

Adrian X-Ray Mfg. Co., Milwaukee.
Production line X-ray machine.

Advance Engineering Corp., Duncannon, Pa.
Metal spraying pistol.

Aetna Ball Bearing Mfg. Co., Detroit.
Clutch release ball bearing.

Air Reduction Sales Co., New York.
Attachment for radiagraph; Torch attachment; Two-stage reduction regulator; Portable tensile and bend testing machine.

Ajax Flexible Coupling Co., Westfield, N. Y.
Mechanical shaking device.

Ajax Mfg. Co., Euclid, O.
Forging rolls; Solid frame forging press.

Albertson & Co. Inc., Sioux City, Ia.
Electric drill.

Aldrich Pump Co., Allentown, Pa.
High pressure reciprocating steam pump equipped with balanced piston type valve chest.

Alemite Corp., Chicago.
Lubrication barrel pump.

Allen-Bradley Co., Milwaukee.
Semiautomatic resistance starter; A.C.-D.C. solenoid type contactors; A.C. magnetic contactors; A.C. reversing switches; A.C. combination starting switches; Automatic across-the-line switches; High-tension across-the-line starting switch; Automatic resistance starter; Automatic increment starter; Automatic increment transformer type; Automatic slip ring motor starter.

Allis-Chalmers Mfg. Co., Milwaukee.
Four 115,000 horsepower cast steel spiral casing hydraulic turbines; Turbo-generator, 80,000 kilowatt, 1800 r.p.m. tandem compound unit; Single-deck screen; Voltage adjuster; Sheaves for V-belt drives; Automatic machine for performing six different operations in fabrication of radiator tubes for transformers.

Alloy Products Corp., Waukesha, Wis.
Self-aligning couplings.

American Blower Corp., Detroit.
Air conditioning equipment; Dust collector, type ST; Unit heater.

American Brass Co., American Metal Hose Branch, Waterbury, Conn.
Flexible steam connection.

American Car & Foundry Co., New York.
Electric metal heater.

American Chain Co. Inc., Bridgeport, Conn.
Utility jack, ACCO No. 35.

American District Steam Co., North Tonawanda, N. Y.
Combination float and thermostatic type steam trap; Packless expansion joint.

American Electric Fusion Corp., Chicago.
Projection welder.

American Foundry Equipment Co., Mishawaka, Ind.
Foundry flask.

American Hard Rubber Co., New York.
Rubber tank lining; Centrifugal pump.

American Hoist & Derrick Co., St. Paul.
One-half-yard shovel-crane-dragline, model 350.

American Machine & Metals Mfg. Corp., Riehle Division, New York.
Complete line of precision hydraulic universal testing machines in all capacities from 20,000 up to and including 600,000 pounds; Production wire tester; Compression machines for concrete; Combination Izod Sharpy tension impact testing machine in 110 and 220 foot-pound capacities.

American Manganese Steel Co., Chicago Heights, Ill.
Composite type power shovel dippers.

American Meter Co. Inc., New York.
Improved instrument case.

American Optical Co., Southbridge, Mass.
Ful-Vue goggle; Hot workers' goggle; Chemical goggle, known as Duralite-50; Six-curve lenses.

American Pulley Co., Philadelphia.
Motor base.

American Pulverizer Co., St. Louis.
A line of small ring and hammer mills.

American Radiator Co., New York.
Replaceable air filter.

American Screw Co., Providence, R. I.
Sheet metal screws.

American Tool Works Co., Cincinnati.
Multiproduction lathe; Lathe with 11, 12, 12½-inch spindle holes; Radial drills; Improved triple purpose radial drills; Improved shapers; Thirty-inch gun boring and turning lathe; Twenty-four-inch double carriage piston rod machining lathe.

Ancorlox Co., New York.
Locking device for nuts and bolts.

Anderson Valve Corp., Pittsburgh.
Through-flow cone valves.

Andrew C. Campbell Division, American Chain Co. Inc., Bridgeport, Conn.
Wet abrasive cutoff machine; Bar type floor stands.

Angell Nail & Chaplet Co., Cleveland.
Chaplet.

Anthony Co., Long Island City, N. Y.
Single and duplex strainers.

Appleton Electric Co., Chicago.
Additions to line of explosion-proof malleable iron fittings.

Apex Tool & Cutter Co. Inc., Shelton, Conn.
Heavy-duty tools.

Armstrong-Blum Mfg. Co., Chicago.
Tapping machines.

Armstrong Bros. Tool Co., Chicago.
Detachable socket wrenches.

S. A. Asquith & Son, Los Angeles.
Gear hobbing attachment for a 15-inch lathe.

E. C. Atkins & Co., Indianapolis.
Replaceable-blade hole saw.

Autocall Co., Shelby, O.
Central control units.

Automatic Nut Co., New York.
Structural rib bolt used with automatic nut.

Automatic Temperature Control Co. Inc., Philadelphia.
Time controls.

Bacharach Industrial Instrument Co., Pittsburgh.
A pyrometer for indicating and recording temperature of steel during rolling; Stationary gas analyzer; Two-liquid manometer for gas burner adjustments.

Bailey Meter Co., Cleveland.
Automatic adjustable orifice; Air-operated combustion control system; Indicator controller for furnace or temperature; Draft controller.

Baker Bros. Inc., Toledo, O.
Hydraulic feed multiple spindle machine; Hydraulic feed drill.

Baker Perkins Co. Inc., Saginaw, Mich.
Foundry sand mixer.

Baker-Raulang Co., Cleveland.
Five-ton streamlined high-lift truck; Tractor for low clearance operation; Three-ton capacity swivel fork attachment for high lift truck.

Baldor Electric Co., St. Louis.
Bench grinder.

Baldwin Carrier Co., Chicago.
Motor-driven belt conveyor.

Baldwin-Duckworth Chain Corp., Springfield, Mass.
Flexible chain coupling.

Baldwin-Southwark Corp., Philadelphia.
High-speed hydraulic presses; Hydraulically-operated toggle presses; Plate planer with electrically-controlled tool feeds; Spring grinding for helical springs; Rubber printing mat press; High-production rubber shear; Two-cylinder solid carbon dioxide ice presses.

Ball & Jewell, Brooklyn, N. Y.
Rotary cutter.

Bank's Radio Mfg. Co., Chicago.
Two-way industrial telephone system.

Bantam Ball Bearing Co., South Bend, Ind.
Tapered roller bearings; Roller aligner; Conical roller thrust bearings.

Barber-Greene Co., Aurora, Ill.
Coal handlers (flight and belt conveyors, self-loading); Selflo line of coal handlers; Self-loading crawler-mounted flight and belt conveyors; Model 82 bucket loader.

Barco Mfg. Co., Chicago.
Improved swivel joints.

W. F. & John Barnes Co., Rockford, Ill.
Hydraulic units; Duplex machine for finish boring cylinder blocks.

Barnstead Still & Sterilizer Co., Boston.
Solvent recovery still.

Barrett-Cravens Co., Chicago.
Portable barrel elevator; Tin plate elevator; Drain rack; Lift truck.

C. O. Bartlett & Snow Co., Cleveland.
Air filters.

Bastian Blessing Co., Chicago.
GX welding torch; SX welding torch; Gas economizer.

Bausch & Lomb Optical Co., Rochester, N. Y.
Electroplater's microscope; Ortho-Stereo camera and stereoscope; Large and small contour measuring projectors; Surface illuminator; Textile projector; Cotton maturity microscope (polarizing); Microtome knife sharpener; Electric microtome; Grain size measuring eyepiece; Green's refractor; Hydraulic ophthalmic chair and instrument stand; Photomicrographic cameras.

Beardsley & Piper Co., Chicago.
Automatic sandslinger.

Bearing Appliance Co., Ardmore, Pa.
Bearing closures.

Beaton & Cadwell Mfg. Co., New Britain, Conn.
Control unit for hot water heating systems.

Beaver Pipe Tools Inc., Warren, O.
Pipe reamer; Sawing vise; Nipple chuck; Improvements in model A pipe machine.

Benjamin Electric Mfg. Co., Des Plaines, Ill.
Mercury vapor lamp fixtures.

Binks Mfg. Co., Chicago.
Spray guns; Touch-up outfit; Paint spray regulator; Heavy material spray gun; Cooling towers; Spray painting machine; Flow gun; Air connection support; Detachable hose connection; Spray gun nozzle head.

Black & Decker Mfg. Co., Towson, Md.
Sanders; Drill.

Blackhawk Mfg. Co., Milwaukee.
Hydraulic jack.

Blanchard Machine Co., Cambridge, Mass.
Surface grinder, No. 18.

Blaw-Knox Co., Pittsburgh.
Stair tread.

E. W. Bliss Co., Toledo, O.
High-speed press; High-speed automatic press.

Blue Valley Machine & Mfg. Co., Kansas City, Mo.
Flanging machine.

Bradford Machine Tool Co., Cincinnati.
Automatic drilling unit.

Bradley Washfountain Co., Milwaukee.
Wash fountains.

Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
Shear blade grinder.

Bristol Co., Waterbury, Conn.
Spiral record cam-operated electrical operation recorder; Flow meter; Pyrometer controller, model 478; Recording absolute pressure gage.

Brookville Locomotive Co., Brookville, Pa.
Locomotive.

Browning Crane & Shovel Co., Cleveland.
Wide gage locomotive cranes carrying booms up to 100 feet or more; Twenty-five-ton locomotive crane powered by either diesel, gas or electric motor; Crawler shovels.

Brown Instrument Co., Philadelphia.
Air-operated controllers.

Brown & Sharpe Mfg. Co., Providence, R. I.
No. 1 wire feed screw machine (redesigned); No. 2 plain milling machine (light type); No. 5 surface grinding machine; No. 12 plain milling machine; No. 0 Omniversal milling machine; No. 12 universal milling attachment; No. 12H vertical milling attachment; Internal grinding fixture, No. 42; Clamp for dial indicators, No. 734A; One-inch heavy micrometer head, No. 296; Tube micrometer caliper, No. 228; Surface plate square; Micrometer calipers, Nos. 8-S and 10-S; Bench micrometer caliper No. 240RS; Stainless steel rule, No. 391.

Buckeye Portable Tool Co., Dayton, O.
Electric screwdriver.

Buckeye Traction Ditcher Co., Findlay, O.
Machine for spreading all kinds of surfacing material.

Bucyrus-Erie Co., South Milwaukee, Wis.
Power excavators comprising a ¾-yard, diesel, gas or electric; 2½-yard, diesel; 2½-yard, electric; 30-yard giant electric power shovel; A line of drills including 21-W, 29-W, 38-W water well drills, and 38-T blast hole drill.

Budd-Ranney Engineering Co., Columbus, O.
Improved automatic nut blanking machine.

Bull Dog Electric Products Co., Detroit.
Wire grips.

Bullard Co., Bridgeport, Conn.
Type J Mult-Au-Matic; Roto-broach.

Burgess Co. Inc., Beaver Falls, Pa.
Mechanical tack hammer.

Byers Machine Co., Ravenna, O.
One-half-yard full revolving shovel.

Cambridge Wire Cloth Co., Cambridge, Md.
Wire cloth annealing trays and baskets; Guard plate edging for woven wire conveyor belts; Woven wire conveyor belting equipped with drive chains.

Carboloy Co. Inc., Detroit.
Diamond impregnated wheel dresser.

Carborundum Co., Niagara Falls. Also Hutto Div., Detroit.
Two new toolroom wheels; Polishing wheel; Cylinder finishing hones; Connecting rod hone; Gear lapping machine; Honing machine; Horizontal honing and lapping machine.

A. W. Cash Co., Decatur, Ill.
Controllers.

Central Iron & Steel Co., Harrisburg, Pa.
Rolled steel floor plate.

Centrifix Corp., Cleveland.
Exhaust line purifier.

Century Electric Co., St. Louis, Mo.
Squirrel-cage normal torque and high-torque motors; Electric power system for truck refrigeration; Splash-proof slip ring polyphase motors.

Chambersburg Engineering Co., Chambersburg, Pa.
High-speed precision type hydraulic presses; Pneumatic key drivers for use in forge shops; Numerous improvements in design of trimming presses, steam hammers, etc.

Chemical Equipment Co., Montpelier, Ind.
Carboy pump; Packingless valve; Unit acid centrifugal pumps.

Chemical Publishing Co. of New York, Inc., New York.
Laboratory stirrer; Balance.

Chicago Eyeshield Co., Chicago.
Wide vision chipping goggle.

Chicago Flexible Shaft Co., Industrial Furnace Division, Chicago.
Gasifier unit.

Chicago Pneumatic Tool Co., New York.
Two-stage air-cooled air compressors, portable and stationary; Complete new line of universal electric tools; Diesel engines.

Chicago Wheel & Mfg. Co., Chicago.
Hand grinder.

Cincinnati Bickford Tool Co., Oakley, Cincinnati.
Upright drills; High-speed all-geared radial drills.

Cincinnati Electrical Tool Co., Cincinnati.
Combination cutoff machine and grinder.

Cincinnati Lathe & Tool Co., Cincinnati.
Geared-head motor-driven lathes.

Cincinnati Milling Machine & Cincinnati Grinders Inc., Cincinnati.
Motor-driven universal milling attachment; Cutter and tool sharpening machine; Broaching set-ups; Roll grinding machine; Universal miller.

Cincinnati Planer Co., Cincinnati.
Forty-two-inch die block planer; Forty-eight-inch forge planer with electric feed; Fifty-six-inch high-speed planer; Eight-foot side head vertical boring mill.

Cincinnati Shaper Co., Cincinnati.
High-speed rapid traverse shaper; All-steel shear; Front-operated power back gage for the all-steel shear; Larger size all-steel press brake.

Clark Controller Co., Cleveland.
Multi-point float switch; A line of air-operated welder contactors with automatic timing of the weld; Automatic sheet measuring device; Safety non-repeat press control for air-operated clutch-brake power press operation.

Clark Equipment Co., Buchanan, Mich.
Riveting process and equipment for use where one side of work is inaccessible.

Clark Tructractor Co., Battle Creek, Mich.
Gas-propelled towing tractor, three models; Telescopic lift trucks—tiering trucks in two models with telescopic lifts.

Claud S. Gordon Co., Chicago.
Thermocouple head.

Cleveland Crane & Engineering Co., Wickliffe, O.
All-welded roller bearing crane, capacity 200 tons, length of span 100 feet; All-welded crane with 120-foot span; Four-runway underslung crane, 60-foot span; Motor-operated grab for handling molds; Turntable for tramrail systems; Cantilever telescoping beam for unloading from gondola or flat cars; Clamp for suspension of tramrail systems.

Cleveland Pneumatic Tool Co., Cleveland.
Four-way poppet type valve, mod-

el J; Rotary air drills, 101 series; Rotary air grinders, 800 series.

Cleveland Punch & Shear Works Co., Cleveland.
Four-point suspension press, welded steel construction; Double-crank gap press equipped with automatic roll feed; Trimming press for upsetting test pieces; High-speed deep throat punch type press.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Washing and drying units.

Columbian Iron Works, Chattanooga, Tenn.
Fire hydrant.

Columbo Machine Co., New York.
Metal hack sawing machine.

Columbus McKinnon Chain Corp., Tonawanda, N. Y.
Alloy steel sling chain.

Combustion Engineering Co. Inc., New York.
Coal pulverizer.

Concrete Surfacing Machinery Co., Cincinnati.
Cleaning tool.

Continental Electric Co., St. Charles, Ill.
Vacuum power switch.

Continental Machine Specialties Inc., Minneapolis.
Combination band filing and band sawing machine.

Conway Clutch Co., Cincinnati.
Fractional horsepower disk clutch; Compression clutches for heavy-duty, slow speed transmission of power; Heavy-duty gear tooth drive type disk clutch.

Cooper-Bessemer Corp., Mt. Vernon, O.
Improved diesel engines

Coppus Engineering Corp., Worcester, Mass.
Twenty-two-inch steam turbine; Turbines with built-in speed reducers; Complete line of air filters of new design.

Craftsweld Equipment Corp., New York.
Electrode holder.

Crossley Machine Co., Trenton, N. J.
Ball mills.

Cullen-Friestedt Co., Chicago.
Sheet lifter.

Cutler-Hammer Inc., Milwaukee.
Improved magnetic clutch; Motor-mounted brakes; Small motor starter; Small drum switch; Improved meter switch; Welding control apparatus; Mill contactors and calorimeter for steel mill service.

Dallett Co., Philadelphia.
Electric cable connectors.

Dalrae Tools Co., Syracuse, N. Y.
Milling attachment.

Danly Machine Specialties Inc., Chicago,
All-steel die sets; Standard die sets.

Davenport Locomotive Works, Div. of Davenport Besler Corp., Davenport, Ia.
Locomotives.

Davenport Machine Tool Co. Inc., Rochester, N. Y.
Threading attachment for 5-spindle screw machine.

Davey Compressor Co. Inc., Kent, O.
Power takeoff.

Dayton Rogers Mfg. Co., Minneapolis.
Adjustable spacing collar for milling cutter arbors.

Dayton Rubber Mfg. Co., Dayton, O.
Oilproof V-belt; Pulleys.

Decatur Pump Co., Decatur, Ill.
Condensation return unit.

De Laval Steam Turbine Co., Trenton, N. J.
Boiler feed pump.

Delta Mfg. Co., Milwaukee.
General purpose grinders

Delta-Star Electric Co., Chicago.
Disconnecting switches; Group-operated switches; Indoor bus supports; Solderless clamp type connectors; Oil-immersed oil switch; High voltage switches.

Deming Co., Salem, O.
Sump pumps.

Denison Engineering Co., Columbus, O.
Heavy-duty hydraulic straightening and forming press; Hydraulic pump, variable volume; Hydraulic equipment for walking beam furnace operation; Hydraulic propeller for circular kilns; Hydraulic power unit for broaching machine operation; Hydraulic power unit for autoclave operation; Hydraulic pile driver.

Despatch Oven Co., Minneapolis.
Convected air tempering furnace; Forced draft horizontal and vertical flow drying ovens; Moist air cabinets; Hot air sterilizers, electric and steam; Improvements in core and mold ovens, coil and armature ovens, finish baking and drying ovens, dryers, and in ageing and curing ovens.

Detroit Testing Machine Co., Detroit.
Attachment for brinell machine.

DeVilbiss Co., Toledo, O.
Flow gun; Tannic acid atomizer; Air cap for spray gun; Spray coating machine and down-draft spray booth; Paint filter for spray booths.

De Walt Products Corp., Lancaster, Pa.
Metal cutting machines.

Diamond Expansion Bolt Co., Garwood, N. J.
Crimp nut; Lag screw expansion shield.

Harry W. Dietert Co., Detroit.
Moisture indicator; High dry sand strength accessory; Rapid sand washer.

Dings Magnetic Separator Co., Milwaukee,
Magnetic clutch coupling; High-intensity magnetic pulley.

Dravo-Doyle Co., Pittsburgh.
Direct-fired unit heater.

S. R. Dresser Mfg. Co., Bradford, Pa.
Pipe coupling.

Dumore Co., Racine, Wis.
Governor-controlled motors; Motor and compressor; Flexible shaft tool.

Durametallic Corp., Kalamazoo, Mich.
Mechanical seal.

Eastern Machine Screw Corp., New Haven, Conn.
Die head.

Eclipse Counterbore Co., Detroit.
Variable length holder with 0.001 adjustment.

Edison Electrical Controls, Division of Thomas A. Edison Inc., West Orange, N. J.
Temperature control.

Eisler Engineering Co., Newark, N. J.
Electric spot welders; Combination welder and trimmer.

Electric Air Heater Co., Div. of the American Foundry Equipment Co., Mishawaka, Ind.
Electric unit heaters.

Electric Controller & Mfg. Co., Cleveland.
Automatic repeat process timer; Weatherproof safety switches; Lifting magnet, type RH, 25-inch diameter; Line-arc magnetic contactors; Safety limit stop.

Elgin Softener Corp., Elgin, Ill.
Flow meter.

Elwell-Parker Electric Co., Cleveland.
Elevator truck.

Engineering & Research Corp., Washington, D. C.
Sheet metal former.

Erie Steel Construction Co., Erie, Pa.
Motor-driven grab bucket.

Esterline-Angus Co., Indianapolis.
Graphic recording KVA meter.

Ettco Tool Co., Brooklyn, N. Y.
Tapping atachment.

Euclid Crane & Hoist Co., Euclid, O.
Helical-geared electric hoist in ½ and 1-ton capacities.

Euclid Road Machinery Co., Cleveland.
Diesel-electric locomotives.

Ex-Cell-O Aircraft & Tool Co., Detroit.
Precision thread grinder; Style No. 218 senior precision boring machine; Style No. 215 senior precision boring machine; Carbide tool grinder; Hydraulic power units; Angular type heavy-duty precision boring machine; Hydraulic power unit drilling machine.

Excelsior Tool & Machine Co., East St. Louis, Ill.
High-speed twin wheel grinding and polishing machine; Stainless steel sheet polishing machine for large production steel mills.

Fairbanks Co., New York.
Plug type valve.

Fairbanks, Morse & Co., Chicago.
Printomatic weigher; Centrifugal pumps, 10, 12 and 14-inch; Rotary pumps, 300 gallons per minute capacity; Built-together motor pump units; Air conditioning equipment.

Falk Corp., Milwaukee.
Dynamometer known as a "Wellometer."

Farrel-Birmingham Co. Inc., Ansonia, Conn.
Roll grinder; Gear generating machine.

Farval Corp., Cleveland.
Full automatic system of oil lubrication, type C.

J. N. Fauver Co., Detroit.
Pneumatic trolley lubricator.

Fedders Mfg. Co, Inc., Buffalo.
Unit heaters.

Federal Machine & Welder Co., Warren, O.
High-speed automatic spot, projection, flash and percussion welders; Photoelectric control, heating equipment; Aluminum welding equipment.

Federal Press Co., Elkhart, Ind.
Cap screw and bolt trimming and extruding machine.

Fellows Gear Shaper Co., Springfield, Vt.
Gear finishing machine using two gap type cutters; Hourglass gear shaper for cutting hourglass worms; Straight worm lapping machine; Bench-type involute measuring machine; Gap type finishing cutters.

Flexible Steel Lacing Co., Chicago.
Belt cutting tool.

Foley Mfg. Co. Inc., Minneapolis.
Die making machine.

Foote Bros. Gear & Machine Co., Chicago,
Compact hoisting drive incorporating worm-type powered gear unit; Oil well reduction units, type DO and SO; Small stoker drive, No. 00; Refinements in entire line of complete reduction units.

Foote-Burt Co., Cleveland.
Single slide surface broaching units.

Ford Motor Co., Johannsen Division, Detroit.
Gaging system set No. 2.

Fosdick Machine Tool Co., Cincinnati.
Radial drill; Sensitive drills; Upright drill.

Foster Machine Co., Elkhart, Ind.
Screw machine. No. 1 motor-in-base unit; Universal turret lathe, 1½, 2 and 2½-inch bar capacity;

Improved chucking machines, 16-speed head with four automatic speed changes.

Fostoria Pressed Steel Corp., Fostoria, O.
Industrial machine lamp.

Foxboro Co., Foxboro, Mass.
Accessory for air-operated control valves.

French & Hecht Inc., Davenport, Ia.
Wheelbarrow equipped with pneumatic tire.

Gamewell Co., Newton, Mass.
Selective relay.

Garden City Fan Co., Chicago.
A line of fans and blowers for circulating air in furnaces and ovens.

Gardner-Denver Co., Quincy, Ill.
Air compressors.

Garlock Packing Co., Palmyra, N. Y.
Unit oil seal.

Gast Mfg. Corp., Bridgman, Mich.
Core mold sprayer.

Garrison Engineering Corp., Waterbury, Conn.
Fire extinguisher.

General Abrasive Co., Niagara Falls, N. Y.
Polishing grain.

General Electric Co., Schenectady, N. Y.
Mill type direct-current contactors; Magnetic contactors; Phase rotation indicator; Automatic time switches; Thickness gage; Push-button master switches; Frequency changer; Oil blast breakers; Electric enameling furnace; Four conduit grounding items; Metal-clad switchgear; Full range permeameter; Cycle recorder; Light-duty outdoor disconnecting switches; High-speed relays for protection of mercury arc rectifiers; Photoelectric relay for outdoor lighting control; Light meter.

General Electric Vapor Lamp Co., Hoboken, N. J.
High-intensity mercury vapor lamp.

General Hydraulic Co., Bucyrus, O.
A line of high-pressure variable speed hydraulic transmissions, pumps and hydraulic motors.

General Plate Co., Attleboro, Mass.
Electrical contact button.

Geometric Tool Co., New Haven, Conn.
Style EJ2 solid adjustable die heads; Style DJ solid adjustable die heads; No. 12 1-inch maximum capacity threading machine; Style KH2 stationary self-opening die heads.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Multiple head high power precision horizontal boring, drilling and milling machine; Floor-type high power precision horizontal boring, drilling and milling machine.

Gisholt Machine Co., Madison, Wis.
Turret lathes.

Gits Bros. Mfg. Co., Chicago.
New type oiler embodying transparent plastic bottle.

Gleason Works, Rochester, N. Y.
Spiral bevel pinion rougher; Single-cycle gear finishing machine; Flame hardening machine.

Goetze Gasket & Packing Co. Inc., New Brunswick, N. J.
Multiseal gasket.

B. F. Goodrich Co., Akron, O.
Plastic material.

Goodyear Tire & Rubber Co., Akron, O.
Vulcanized splice for belts.

Gorton Heating Corp., Cranford, N. J.
Air eliminator.

G. A. Gray Co., Cincinnati.
Milling planer.

Greaves-Klusman Tool Co., Cincinnati.
Geared-head engine lathes.

Greenerd Arbor Press Co., Nashua, N. H.
Hydraulic arbor press.

Grob Bros., West Allis, Wis.
Open-end band saws.

Hall Planetary Co., Philadelphia.
Planetary milling machine.

Hamilton Mfg. Co., Two Rivers, Wis.
Steel-and-wood drafting tables.

Hammond Machinery Builders Inc., Kalamazoo, Mich.
Polishing lathes.

Hammond Mfg. Co., Cleveland.
Three-way hydraulic drilling and reaming machine; Automatic machine for performing four boring and reaming operations.

Hanchett Mfg. Co., Big Rapids, Mich.
Rotary surface grinder; Vertical spindle surface or face grinder.

Hancock Valve Division, Consolidated Ashcroft Hancock Co. Inc., Bridgeport, Conn.
Combined valve and control instrument; Globe valve.

Hanna Engineering Works, Chicago.
Complete line of electro-hydraulic riveters, both portable and stationary; Portable pneumatic press for pressing spring shackle bushings and pins in automobile chassis frames; A 48-inch reach pneumatic riveter with graduated die adjustment; A standardized line of air and oil cylinders ranging from 2 to 20 inches in diameter, applicable for pushing, pulling, raising, lowering.

Hannifin Mfg. Co., Chicago.
Straightening press; Portable hydraulic riveter; Air-operated molding press; Hydraulic riveting press, 1600 pounds per square inch maximum working pressure.

Hanson-Van Winkle-Munning Co., Watawan, N. J.
Centrifugal dryer; Burnishing barrel; Filter bags to keep plating solutions clean.

Harnischfeger Corp., Milwaukee.
All-welded excavator in ⅜ and ½-cubic yard capacities; Electric hoist in 250 and 500-pound capacities; Heavy-duty 200 and 300-ampere welders; Rail crane for spur handling; Portable battery charging generator sets; New series of large 75 horsepower vertical slip ring motors; Gas-powered power unit for supplying electrical energy to outlying districts; Automatic eight-station barrel renovator; Fifty-ampere welder for light gage metals.

Hartzell Propeller Fan Co., Piqua, O.
Fan known as the "Birdwing" type.

R. G. Haskins Co., Chicago.
Heavy-duty tapping machine.

Hays Corp., Michigan City, Ind.
Draft recorders; Recorders.

Heald Machine Co., Worcester, Mass.
Precision boring machine for facing and grooving, No. 44; Precision boring machine for handling large work at conveyor level, No. 45; Small double-end precision boring machine, No. 49; Single-end universal precision Bore-Matic machine, No. 49; Large internal grinding machine, No. 74; Gap internal grinding machine, No. 72A.

Helmer & Staley, Chicago.
Paint in stick form.

Henry Vogt Machine Co., Louisville, Ky.
Braceless fusion welded H.R.T. boiler; Class 1 acetylene welded pressure vessels.

Henry & Wright Mfg. Co., Hartford, Conn.
Automatic feed presses; dieing machine; Press; Stock reel.

Herben Machinery & Equipment Co., Chicago.
Angle vise.

Hergi Mfg. Co., Bridgeport, Conn.
Flexible shaft outfit.

Hevi Duty Electric Co., Milwaukee.
High-temperature industrial furnaces.

High Speed Hammer Co. Inc., Rochester, N. Y.
High-speed riveting hammer for heavy cold riveting work.

Hills-McCanna Co., Chicago.
Force-feed lubricators.

D. A. Hinman & Co., Sandwich, Ill.
Pipe, tube and rod bender.

Hisey-Wolf Machine Co., Cincinnati.
Bench grinders; Motor-driven drill grinders; Portable motor-driven worm thread grinder.

Hobart Bros. Co., Troy, O.
Three new turret top arc welders of 75, 100, and 150-ampere capacity, respectively.

Hodson Co., Chicago.
A series of pressure tanks for applying by air a plastic cable compound.

O. Hommel Co., Pittsburgh.
Flat spray machine.

Hoover Steel Ball Co., Ann Arbor, Mich.
Addition of 75 new sizes of radial and angular contact type ball bearings to present line, embracing both single and double-row types; Numerous special sizes and types of bearings for specific applications.

H. D. Hudson Mfg. Co., Oshkosh, Wis.
Machine tool pump.

Hunt Mfg. Co., Chicago.
Automatic hose valve.

Hydraulic Press Mfg. Co., Mt. Gilead, O.
Hydro-power fast traverse presses.

Hydro-Motive Co., Chicago.
Hydraulic pump.

Ideal Electric & Mfg. Co., Mansfield, O.
Arc welder.

Illinois Steel Co., Chicago.
Anti-skid floor plate.

Illinois Tool Works, Chicago.
Die filing machine; Hob tooth profile measuring machine; Normal pitch and space measuring machine; Involute profile measuring machine; Helical lead measuring machine; Gear charting machine; Hob lead measuring machine; Cutter sharpening testers.

Independent Air Filter Co., Chicago.
Double-duty all-steel filter; Dry fabric type filter; Hair pad filter.

Independent Pneumatic Tool Co., Chicago.
Balancers featured by tapered drum; Portable drill.

Industrial Brownhoist Corp., Bay City, Mich.
Electric portal pier crane arranged for straight line operation.

Ingersoll Milling Machine Co., Rockford, Ill.
Zee lock face milling cutters; Side milling cutters; Zee lock end mills; Core drills and reamers; Zee lock counterbores; Openeside boring unit.

Ingersoll-Rand Co., Phillipsburg, N. J.
Impact wrench; Two-stage air-cooled portable compressor, model 60-A; Steam driven compressor, XPV; Synchronous motor or belt-driven compressors, XRE, XRB, XCB; Motorpump; Fractional horsepower motorpump.

D. O. James Mfg. Co., Chicago.
Speed reducers.

International Machine Tool Co., Indianapolis.
Universal flexible general purpose lathe.

Jeffrey-Traylor, Div. of Jeffrey Mfg. Co., Columbus, O.
Electric vibrating feeder.

Jenkins Bros., Bridgeport, Conn.
Colored valve wheels.

Johns-Manville Corp., New York.
Heavy-duty brake lining.

Johnston Mfg. Co., Minneapolis.
Pneumatic two-position valveless automatic controllers for furnaces and ovens; Anticipators for use with two-position control instruments to give substantially straight line temperature control; Crucible heaters for preheating pouring crucibles used with electric and combustion type brass melting furnaces; New developments in large car bottom annealing furnaces using only one or two burners and with refractory insulating brick linings; Air drawing furnaces for springs.

Jones & Lamson Machine Co., Springfield, Vt.
Saddle type turret lathes.

Jones & Laughlin Steel Corp., Pittsburgh.
Drill pipe which eliminates the use of the conventional tool joint.

Junkin Safety Appliance Co., Louisville, Ky.
Triple interlock safety guard.

Kane & Roach Inc., Syracuse, N. Y.
Roll straightener with shears and automatic measuring and dumping table; Rotary straightener, capacity ¼ to ¾-inch round bars; Nine-roll sheet leveller; Five-roll core wire straightener; Thirty-two roll combination horizontal and vertical straightener; Twenty roll combination horizontal and vertical straightener; Sizes No. 28, 29 and 30 double housing rapping type bending rolls; Cold roll forming machines, Nos. 00L, 1L and 4L; Punch press with automatic measuring and dumping table.

Kearney & Trecker Corp., Milwaukee.
Milling machines.

Kellogg Switchboard & Supply Co., Chicago.
Annunciator units.

Kent-Owens Machine Co., Toledo, O.
Cam feed type milling machine; Automatic milling machine.

Walter Kidde & Co., Inc., New York.
Hand fire extinguisher.

Kingsbury Machine Tool Corp., Keene, N. H.
Fleximatic; Drilling units.

William F. Klemp Co., Chicago.
Surface armor.

Kling Bros. Engineering Works, Chicago.
Friction saw, down stroke type; Hydraulically-operated grinder.

Kron Co., Bridgeport, Conn.
Weight printing attachment for dial scales; Bench scale in capacities from 25 to 100 pounds.

Lake Erie Engineering Corp., Buffalo.
Autobody panel press; Self-contained die sinking press; Plastic molding press; Matrix press.

Lammert & Mann Co., Chicago.
Control or automatic shutoff valve.

Landis Machine Co., Waynesboro, Pa.
Tap chaser rake grinding attachment; Timing attachment for threading staybolts on Landmaco threading machine; Tap chaser throat grinding attachment; Lanco die head with taper attachment; Aligning and indexing fixture for Landmaco threading machine; Beveling and facing attachment for Landis pipe threading and cutting machine; Holding and centering attachment for Landmaco threading machine; Extension link for collapsible taps.

Landis Tool Co., Waynesboro, Pa.
Hydraulic internal grinders, 15-inch type C; Plain hydraulic grinders, 10, 14, 16-inch type D; Semi-automatic hydraulic grinders, 10-inch type C; Hydraulic cam grinders, 5-inch type D.

Langelier Mfg. Co., Providence, R. I.
Swaging machines; Sensitive drill.

Langlois Grinding Co., Inc., Detroit.
Concentrometer.

P. M. Lattner Mfg. Co., Cedar Rapids, Ia.
Industrial gas flueless boiler.

R. K. LeBlond Machine Tool Co., Cincinnati.
Multi-cut semiautomatic lathe, No. 9; Twenty-five-inch heavy-duty engine lathe; Drum-type four-station crankshaft line bearing lathe; Improved cutter grinder.

Leeds & Northrup Co., Philadelphia.
Numerals in colors for recorders; Tempering furnace.

Lehmann Machine Co., St. Louis.
Lathe.

E. Leitz Inc., New York.
Simplified dilatometer for automatic and photographically recording temperature; Automatic magnetic polishing machine; Universal photomicrographic apparatus; Special vacuum heating chamber attachable to Leitz micro-metallograph for observation of metal specimens.

Lima Locomotive Works Inc., Shovel & Crane Division, Lima, O.
Combination shovel, dragline and crane, 2¼-cubic yard capacity.

Lincoln Electric Co., Cleveland.
Toolweld electrode; Stainweld B electrode; 100-ampere shield arc welder; 200-ampere gasoline engine-driven shield arc welder; 300-ampere gasoline engine driven shield arc welder; 200-ampere special engine-driven shield arc welder; Quick detachable cable connector.

Lindberg Engineering Co., Chicago.
Screw type pot furnace.

Linde Air Products Co., New York.
Medium pressure generators; Welding torch; Acetylene generator; Acetylene cylinder manifold.

Link-Belt Co., Chicago.
Antifriction worm geared speed reducers with horizontal or vertical output shaft; Motorized helical gear speed reducers; Motorized P. I. V. gear positive variable speed transmission; New line of antifriction bearings in form of pillow blocks, hangers and take-ups, employing Shafer double-row roller bearings in Link-Belt mountings; Antifriction positive self-aligning idlers for maintaining troughed conveyor belts in central carrying position; Dewatering rotoscoop for recovery of coarse or fine sand and similar materials; Two new models (K-40, K-45) of crawler shovels, cranes, draglines; The company also completely rerated its line of herringbone gear speed reducers to conform with AGMA recommended practice.

F. J. Littell Machine Co., Chicago.
Reel with automatic brake; Roll feed; Feeding, straightening unit.

Littelfuse Laboratories, Chicago.
Dead fuse indicator.

Logan Co., Louisville, Ky.
Improved design of upender for changing position of coils from resting on side to standing on end, and vice versa; Tilting section for discharging coils on side at right angles from a line of trough roller conveyor; Motor-operated reversible turntable; Brake for heavy-duty roller conveyor; Two new types of heavy-duty ball bearings for roller conveyor.

Lovejoy Tool Works Inc., Chicago.
Flexible couplings.

Lubrication Products Co., Cleveland.
Lubrication unit known as "Stapax."

Macwhyte Co., Kenosha, Wis.
Thimble for wire rope slings.

Madison-Kipp Corp., Madison, Wis.
Die casting machines.

Magnetic Mfg. Co., Milwaukee.
Magnetic disk brakes; Combination magnetic clutch brakes of both single and multiple disk construction; High-intensity magnetic drum concentrator; Wet slip magnetic concentrator; Stationary magnetic high-intensity dry concentrator.

Manhattan Rubber Mfg. Co., Div. Raybestos-Manhattan Inc., Passaic, N. J.
Compensated air hose.

Marburg Bros. Inc., New York.
Hydraulically-controlled power hacksaw.

Marion Steam Shovel Co., Marion, O.
Three-fourth-yard shovel of the clutch type powered by either gasoline or diesel engine; Four-yard heavy-duty electric shovel; Thirty-two cubic yard aluminum dipper for largest type of stripping shovel.

Master Brake & Appliance Co. Inc., Trousdale, Kans.
Lathe converter.

Meaker Co., Chicago.
Improvements in equipment including straight-a-way full automatic cleaning and plating machines; Return type cleaning and plating machines; Midget processing conveyor for cleaning and plating, and also for processing of products requiring numerous dips, rinses; Semi-automatic plating machines; Continuous process equipment for galvanizing and electroplating of round and flat wire; Continuous process equipment for galvanizing and plating of wire cloth; In addition continuous equipment for chemical pickling as well as electropickling, etc.

Mercury Mfg. Co., Chicago.
Industrial tractor; Safety self-coupler; High lift ram truck for handling coiled stock; Millwright truck equipped with double-drum winch; Heavy-duty electric truck; Industrial trailer.

Metalweld Inc., Philadelphia.
Electrode holder.

Michigan Tool Co., Detroit.
Lapping machine; Turning tools; Internal gear finishing machine.

Alexander Milburn Co., Baltimore.
Gas and air purifier.

Miller Co., Meriden, Conn.
Combination lamp reflector.

Milligan & Wright Co., Cleveland.
Blueprint machine; Blueprinter.

Minneapolis-Honeywell Regulator Co., Minneapolis.
Thermostat for room temperature control.

Mine Safety Appliances Corp., Pittsburgh.
Carbon monoxide alarm.

Mitts & Merrill Inc., Saginaw, Mich.
Paper excelsior shredder.

M. M. Wire Clamp Co., Minneapolis.
Cleating clamps; Wood buck anchors; Wire twisters; Steel horses.

Modern Equipment Co., Port Washington, Wis.
Bottom pour ladles.

Modine Mfg. Co., Racine, Wis.
Humiditioner.

Monarch Machine Tool Co., Sidney, O.
Semi-automatic double - carriage manufacturing type lathe, model 5-T; Micro-gaging method of accurate tool setting in turning and boring; Multiple automatic length feed stops; Rear vertical necking and forming turret for all sizes of lathes; Hardened cam lock flanged type spindle nose; Centrode device for turning, boring and facing shapes other than round; High-speed, high-powered lathes without gears on spindle for use with tungsten carbide turning tools.

Morse Mfg. Co. Inc., Syracuse, N. Y.
Barrel and drum lifting hook; Saw horse brackets; Cradle truck.

Morton Mfg. Co., Muskegon Heights, Mich.
Flash trimming machine; Keyway cutter and slotting unit; High-duty draw-cut flash trimming machine.

Motor Improvements Inc., Newark, N. J.
Air separator.

National Acme Co., Cleveland.
Model R 6-spindle automatic screw machines in ⅝, ⅞, 1, 1¼, 1⅝, 2, 2¼, 2⅝, and 3-inch sizes; Model R 4-spindle automatic screw machines in 3½, 4, 4½ and 5-inch sizes; Model RU universal chucking machines, 4-spindle, 8-inch chucks; 6-spindle, 6½ and 8-inch chucks; Model RP plain chucking machines, 4-spindle, 8-inch chucks; 6-spindle, 8-inch chucks; Single-spindle automatic for plain work such as nut blanks, pins, rolls, bushings, etc.; DR and DS interchange self-opening die head for use with either circular chasers or blade chasers; DR circular chaser self-opening die head, new size ⅞-inch; DBS circular chaser self-opening die head for use on B&S single-spindle automatics, in sizes ¼, ⅝ and ⅞-inch; Solid adjustable inserted chaser tap; Model L chronolog.

National Carbide Sales Corp., New York.
Emergency carbide light.

National Engineering Co., Chicago.
Intensive mixer, No. 2 model H. Auxiliary equipment available for use with this mixer include screening and magnetic separator units, skip loaders, aerator, etc.

National Industrial Products Corp., Pittsburgh.
Adjustable universal "Oilit" for mill use; Constant level lubricator.

National Machine Tool Co., Racine, Wis.
Shaper vise attachment.

National Machinery Co., Tiffin, O.
Redesigned line of high-duty forging machines; Open die cold header; Precision nut tappers; Refinements in design of Maxipresses.

National Motor Bearing Co., Oakland, Calif.
Oil and grease seal.

New Britain-Gridley Machine Co., New Britain, Conn.
Model 40 four-spindle automatic screw machine; Model 41 four-spindle automatic screw machine; Model 60 six-spindle automatic screw machine; Model 14 four-spindle 6¾-inch automatic chucking machine; Model 49 four-spindle 9-inch automatic chucking machine; Model 675 six-spindle 7½-inch automatic chucking machine.

New Departure Mfg. Co., Bristol, Conn.
Infinitely variable speed transmission known as the Transitorq.

Newman Bros. Inc., Cincinnati.
Gyratory riddle.

Niagara Machine & Tool Works, Buffalo.
Improved type power squaring shears; Master line of inclinable presses and improved types in standard series; Fourteen point engagement sleeve clutch; Foot-operated gap squaring shears; Heavier line of foot squaring shears for cutting 16-gage metal; Special machines for manufacturing steel drums and containers.

Niles Tool Works Co., Hamilton, O.
Vertical grinder with 66-inch magnetic chuck.

A. H. Nilson Machine Co., Bridgeport, Conn.
Self-opening die head.

Norma-Hoffmann Bearings Corp., Stamford, Conn.
A line of complete needle roller bearing units made to metric dimensions and ranging from 12 m/m to 150 m/m bore; Cartridge type 3000 series completely sealed ball bearings with increased grease capacity and grease refilling plug.

Northern Engineering Works, Detroit.
Overhead monorail electric hoist.

Norton Co., Worcester, Mass.
Crankpin grinder, D-86; 6-inch semiautomatic grinder; No. 2 hydraulic tool and cutter grinder (universal); No. 1 universal tool and cutter grinder; No. 24 Hyprolap (lapping machine); Hydraulic steadyrest for plunge-cut machines; New work drive mechanism for Cam-O-Matic; Diamond wheels; BE bond wheels for tool grinding.

Novo Engine Co., Lansing, Mich.
New line of sludge pumps; Four-cylinder engine; Refinements in engine design for economical use of kerosene as fuel; Line of self-priming centrifugal pumps; Pressure pump for water supply and oil field use; Pavement breaker.

Numberall Stamp & Tool Co. Inc., Staten Island, N. Y.
Numbering machine.

Ohio Electric Mfg. Co., Cleveland.
Lifting magnets; Automatic quick-drop magnetic controller which includes the arc suppressor as an integral part of the control panel.

Ohio Carbon Co., Lakewood, O.
Carbon resistor.

O. K. Tool Co. Inc., Shelton, Conn.
Shankless serrated type tool bit.

Osborn Mfg. Co., Cleveland.
Foundry molding machine; Tram-rail trolley wheel.

Oster-Williams, Cleveland.
Gas cutting machine for cutting pipe intersections preparatory to welding; A series of bolt threading machines built in both single and double-spindle types with capacities from ⅜ to 1½ inches and from ½ to 2½ inches; Stationary pipe threading machines of 4 and 6-inch capacities; Portable pipe and bolt threading machines with capacities up to 1⅛ and 2 inches.

Packer Machine Co., Meriden, Conn.
Polishing and buffing machine.

Page Steel & Wire Division, American Chain Co. Inc., Bridgeport, Conn.
High tensile welding wire.

Parker-Kalon Corp., New York.
Hardened metallic drive screw welding stud.

Paslode Co., Chicago.
Small size stapler.

Patterson Foundry & Machine Co., East Liverpool, O.
Agitator drives; Horizontal reduction drive; Liquid mixers.

C. F. Pease Co., Chicago.
Blueprint paper and cloths.

Penn Galvanizing Co., Philadelphia.
Galvanizing kettle.

Pennsylvania Pump & Compresor Co., Easton, Pa.
Air or gas compressor; Air cushion valve vacuum pumps; Centrifugal pumps; Steam booster compressors.

Philadelphia Drying Machinery Co., Philadelphia.
Oil burner; Proportional mixer.

Pier Equipment Mfg. Co., Benton Harbor, Mich.
Spot welders.

Pierce-Miller & Co., Brazil, Ind.
Pulling jacks.

Plymouth Locomotive Works, Plymouth, O.
Locomotive operated on butane gas.

Porter-Cable Machine Co., Syracuse, N. Y.
Electric quick return for carbo-lathe; Hydraulic lathe; Electrical head for carbo-lathe.

Pratt & Whitney Co., Hartford, Conn.
Vertical surface grinder; Automatic toolroom machine; Die sinking cutters; Jig borer; Tilting rotary table; Serrated blade reamers; Lathe.

Production Equipment Co., Cleveland.
Heavy-duty grinder.

Producto Machine Co., Bridgeport, Conn.
Milling machine.

Thomas Prosser & Son, New York.
Widia cemented carbide tool grinder.

Pulmosan Safety Equipment Corp., Brooklyn, N. Y.
Respirator.

Pyrene Mfg. Co., Newark, N. J.
Fire extinguishers.

Pyrometer Instrument Co., New York.
Surface pyrometer.

Quality Die Co., South Chicago, Ill.
Metal marking machine.

Quickwork Co., St. Marys, O.
Press frame; Stamping trimming machines; Rotary shears.

Quincy Compressor Co., Quincy, Ill.
Improvements in design of air and water-cooled, single and two-stage compressors.

Racine Tool & Machine Co., Racine, Wis.
Metal cutting machine.

N. Ransohoff Inc., Cincinnati.
Rotary batch pickling machine; Tilting ball return burnishing barrel; Rinsing and drying machine; Sawdust tumbling barrel and vibrating screen; Continuous drum type washing machine.

Rasmussen Machine Co., Racine Wis.
Power saw machine.

Rattan Mfg. Co., New Haven, Conn.
Solderless connectors.

Reed Prentice Corp., Worcester, Mass.
Turret lathe; Vertical milling and die sinking machine; Die casting machine; Toolroom lathes.

Reeves Pulley Co., Columbus, Ind.
Automatic variable speed rachet control.

Geo. P. Reintjes Co., Kansas City, Mo.
Adaptation of standard wall tiles for use as rear arches on horizontal return tubular boilers.

Reliance Electric & Engineering Co., Cleveland.
New sizes of water-cooled alter-

nating-current motors for use on coilers in continuous hot strip mills; Gearmotors and flange-type open and fan-cooled alternating-current motors with modifications to meet the requirements of individual drive on run-out tables in continuous strip mills; A larger frame size of type T heavy-duty direct-current motors for constant and adjustable speed service (400 horsepower, 400 revolutions per minute).

Republic Flow Meters Co., Chicago.
Furnace pressure regulator; Series 50 (hydraulic) and series 60 (pneumatic) regulators for control of flow, pressure, level and speed; Pressure recorder.

Republic Rubber Co., Youngstown, O.
Oil-resisting pneumatic hose.

Rife Hydraulic Engine Mfg. Co., New York.
Two improved pump strainers.

Robins Conveying Belt Co., New York.
Pivoted bucket conveyor.

Rockford Iron Works, Rockford, Ill.
Straight side press; Inclinable press; Horning press.

Rockford Machine Tool Co., Rockford, Ill.
Hydraulic planer; Improved hydraulic shaper-planer; Improved hydraulic shaper.

Roller-Smith Co., Bethlehem, Pa.
Self-standing steel panels for oil circuit breakers.

B. M. Root Co., York, Pa.
Boring machine.

Roots-Connersville Blower Co., Connersville, Ind.
Small size rotary displacement meter; Inert gas producing unit; Close-coupled sleeve bearing centrifugal blowers and compressors; Condensate return equipment, type T; Oil-fired purging machines.

David J. Ross Co., Benton Harbor, Mich.
Safety device for punch presses.

Ross Carrier Co., Benton Harbor Mich.
Gas-electric tiering machine for handling sheets 12 to 72 inches wide and of any length.

Ross Operating Valve Co., Detroit.
Two pressure operating valves; Straightway solenoid - operated valves; Magnetic (clapper type switch) operated valves for high-speed welding.

Roth Welding Engineering Co. Inc., Detroit.
Automatic spot welder; Synchro-hydromatic welding unit.

Rotor Air Tool Co., Cleveland.
Drill; Six-inch grinder; Disk sander; Electric tools.

Russell Electric Co., Chicago.
Cabinet-enclosed suspended type unit heater; Noiseless unit heater; Air conditioning unit.

Ruthman Machinery Co., Cincinnati.
Pipeless pump, model 11020.

Safety Grinding Wheel & Machine Co., Springfield, O.
Face and knife grinders in sizes having 20 and 30-inch diameter segmental grinding wheels.

W. J. Savage Co. Inc., Knoxville, Tenn.
Nibbling machine.

Schauer Machine Co., Cincinnati.
Speed lathes.

Schlafer Hardware Co., Appleton, Wis.
Flux pot for welders.

Schweitzer & Conrad Inc., Chicago.
Multipoint contact knife blade switches; Fuse.

Sebastian Lathe Co., Cincinnati.
Lathes; Motor drive attachment.

Wm. Sellers & Co. Inc., Philadelphia.
Openside planer.

Seneca Falls Machine Co., Seneca Falls, N. Y.
Automatic lathe; Unit lathe; Star drilling and centering machine; Speed cut lathe.

Sentry Co., Foxboro, Mass.
Electric high speed steel hardening furnace.

Service Caster & Truck Co., Albion, Mich.
Heavy-duty forge weld caster; Push truck.

Service Machine Co., Elizabeth, N. J.
Multi-unit punches.

Service Machine & Iron Works Co., New Orleans.
Full swing tractor crane.

Shafer Bearing Corp., Chicago.
Bearings with piston ring seal.

Shallcross Controls Inc., Milwaukee.
Furnace draft control; Combustion control, measured air type.

Shaw-Box Crane & Hoist Co. Inc., Muskegon, Mich.
Grip lifter; Hand-operated hoist, type WR.

Sheffield Gage Corp., Dayton, O.
Visual gages.

F. B. Shuster Co., New Haven, Conn.
A line of high-speed motor-driven wire straightening, cutting units.

Sidney Machine Tool Co., Sidney, O.
Milling machines.

Signode Steel Strapping Co., Chicago.
Strapping reel and stand.

Skilsaw, Inc., Chicago.
Standard drill; Electric hand grinder; Grinders and buffers; Electric drills.

Sleeper & Hartley Inc., Worcester, Mass.
Improved torsion spring winding machine; Key ringing machine; Paper clip machine; Spectacle case spring machine; Spring spirals machine for loose leaf binding; Steel piston ring machine.

J. K. Smit & Sons Inc., New York.
Combination water and air-cooled diamond holder.

Smith Devices, Philadelphia.
Wedge and roller plate grips; Light and heavy-duty cable grips.

Smith Power Transmission Co., Cleveland.
Reel roller bearing; Belt tensioner.

Smith & Serrell, Newark, N. J.
Flexible coupling.

South Bend Lathe Works, South Bend, Ind.
Entire new line of lathes in 9, 11, 13 and 16-inch swings; Nine-inch "Workshop" lathe; Underneath belt motor drive for the above machine; V-belt drive for 9-inch "Workshop" unit.

Specialty Sales & Service Corp., Minneapolis.
Grease gun head control valve.

Spencer Turbine Co., Hartford, Conn.
Industrial portable vacuum cleaners; Centrifugal type turbo compressors, single stage; Gas boosters.

Sperry Products Inc., Brooklyn, N. Y.
Machine for testing adhesion of lubricants.

Springfield Machine Tool Co., Springfield, O.
Geared-head engine lathe.

Square D Co., Switch and Panel Division, Detroit
Solderless connector; Swing-out interior switch; Trolley square-duct; Swing-out interior range switches; Ganging type switch; Circuit breaker; Explosion-proof switches.

Stackbin Corp., Providence, R. I.
Stacking rack; All-steel platform trucks.

Standard Electrical Tool Co., Cincinnati.
Strip steel polishing machine; Variable speed buffer; Buffer, wide type, motor driven; High-speed snagging grinder; Vertical angle plate grinder, motor driven for planer or boring mill.

Stanley Works, New Britain, Conn.
Portable electric shear; Strapping reel stand.

St. John X-Ray Service Inc., Long Island City, N. Y.
Instrument for X-ray diffraction analysis of metals; X-ray unit for educational work in industrial radiology.

Stephens-Adamson Mfg. Co., Aurora, Ill.
Circular feeder and runaround-type conveyor, developed as variations of the Redler continuous-flow conveyor; Aluminum portable conveyor; Light type belt conveyor carrier.

Sterling Engine Co., Buffalo.
Instrument for indicating viscosity of fuel oil passing to burners.

Sterling Grinding Wheel Co., Tiffin, O.
Segmental wheel and chuck.

Sterling Wheelbarrow Co., Milwaukee.
Special machine for oxyacetylene cutting of long steel bars, channels.

Stokerunit Corp., Milwaukee.
Grinding and lapping machine; Precision unit boring machine.

Stromberg Electric Co., Chicago.
Electric time recorder.

B. F. Sturtevant Co., Inc., Boston.
Heavy-duty floor type heaters, redesigned.

Sullivan Machinery Co., Chicago.
Unit for holding castings while grinding and chipping.

Sundstrand Machine Tool Co., Rockford, Ill.
Small milling machine; Hydraulic sliding head drill unit; Stub lathe; Hydraulic pump, control valve and circuit for machine tool feeds.

Surfacer Mfg. Co., Chicago.
Hand surfacer.

Sutton Engineering Co., Pittsburgh.
Universally adjustable angle drive roll straightener; Cradle type backed-up sheet leveler machine; Independently adjustable drive roll straightener; Backed-up roller leveler.

Swift Electric Welder Co., Detroit.
Hand and automatic flash welders in medium sizes; Automatic air-operated projection, spot and combination projection and spot welders; Automatic barrel welding machine; Portable gun welders, transformers and welding fixtures; Longitudinal seam welder; Improved transformer design.

Syntron Co., Pittsburgh.
Dry chemical feeders.

Tabor Mfg. Co., Philadelphia.
Foundry molding machines; Abrasive wheel cutoff machine.

Taft-Peirce Mfg. Co., Woonsocket, R.I.
Magnetic chuck.

The C. J. Tagliabue Mfg. Co., Brooklyn, N. Y.
Potentiometer controller; Controller.

Tannewitz Works, Grand Rapids, Mich.
Tilting arbor saw benches.

Taylor Instrument Cos., Rochester, N. Y.
Intermitter; Reset controller; Valv-Precisor; Integrating flow meter.

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Taylor-Winfield Corp., Warren, O.
Spot welders; Portable spot welders; Flash welders; Seam welders; Projection welders; Butt welders.

Templeton, Kenly & Co., Chicago.
Tank supports.

Thermo Control Devices Inc., Chicago.
Temperature control.

Thermoid Rubber Co., Trenton, N. J.
Industrial brake lining.

Thew Shovel Co., Lorain, O.
Three new models: 2-yard L-87, 1-yard L-55D, and ¾-yard L-46 truck shovel.

Thomas Spacing Machine Co., Pittsburgh.
Machine for duplicating holes in a template.

Thompson Electric Co., Cleveland.
Lamp lowering hanger embodying improvements including a new two-piece canopy.

Thomson-Gibb Electric Welding Co., Lynn, Mass.
Large strip welder for welding strip in continuous processes in steel mills; Spot-Matic welder; Shimmy welder; Various series portable welders; Tank welders; Dial feed welders; Forging heaters.

Thwing Instrument Co., Philadelphia.
Low resistance pyrometer.

Toledo Machine & Tool Co., Toledo, O.
Press; Straight column press.

Toledo Wheelbarrow Co., Toledo, O.
Two-wheel open-hearth barrow.

Timken Roller Bearing Co., Canton, O.
Simplified antifriction boring mill table mounting; New type of bearing mounting using double cup bearings.

Toledo Scale Co., Toledo, O.
Coke charging scale with graphic recorders and photoelectric cutoff.

Torit Mfg. Co., St. Paul.
Air-gas torch.

Torque Products Co., Milwaukee.
Dynamometer.

Trabon Engineering Corp., Cleveland.
Flat type lubrication feeder.

Harold E. Trent Co., Philadelphia.
Electric immersion units; Electric heating elements and units.

Trico Fuse Mfg. Co., Milwaukee.
Drip-drop oiler.

Trimson Mfg. Co., Cleveland.
Portable surfacer and polisher.

Triplex Machine Tool Corp., New York.
Milling and jig boring unit; Thread grinding machine.

Truscon Steel Co., Youngstown, O.
I-grid flooring.

Tungsten Carbide Tool Co., Detroit.
Tungsten carbide tipped lathe centers.

Tuthill Pump Co., Chicago.
Reversing pump.

Tyson Roller Bearing Corp., Massillon, O.
Lip seal; Multi-labyrinth seal; Combined nut seal.

Udylite Co., Detroit.
Electroplating rheostat; Plating barrel; Small barrel plating unit with detachable cylinder; Copper, zinc and brass ball anodes; Line switch for plating barrels; Humidified buffs; Semi-automatic plating machine; Bright zinc process whereby lustrous zinc coating may be produced.

George Ulanet Co., Newark, N. J.
Spaghetti tubing.

United Engineering & Foundry Co., Pittsburgh.
Welding manipulator.

Universal Gear Corp., Indianapolis
Electric motor-driven gate valve operators; Four-speed two-motor drives; Clarifier tank slow-speed motorized drives; Special motor drive assembly; Specially designed drive; Vari-speed motorized drive units; Design improvements in standard line of speed reducers.

Universal Vibrating Screen Co., Racine, Wis.
Vibrating screen.

U. S. Electrical Mfg. Co., Los Angeles.
Variable speed units.

USL Battery Corp., Niagara Falls, N. Y.
Protected-arc welder.

United States Electrical Tool Co., Cincinnati.
Automatic drill, ¼-inch; One-half-inch drill; Utility bench and floor grinders, 6, 7, 8 and 10-inch.

United States Rubber Products Inc., Mechanical Goods Division, New York.
Hose for pneumatic tool and air drill service.

Universal Power Corp., Cleveland.
Electric arc welders.

V & O Press Co., Hudson, N. Y.
Notching press.

Van Norman Machine Tool Co., Springfield, Mass.
Milling machines; High-speed piston grinder.

Vibration Eliminator Co., Long Island City, N. Y.
Vibration eliminator.

Vickers Inc., Detroit,
Electric-hydraulic control; Hydraulic variable speed transmission.

Vonnegut Moulder Corp., Indianapolis.
Heavy-duty floor stands, buffers and swing frame grinders.

O. S. Walker Co. Inc., Worcester, Mass.
Rotary magnetic chuck; Swivelling magnetic chuck and central control.

Wallace Supplies Mfg. Co., Chicago.
Bending machine.

Walls Sales Corp., New York.
Abrasive band grinder.

Walworth Co., South Boston, Mass.
Bar stock steel valves.

Warner & Swasey Co., Cleveland.
Universal turret lathe, No. 4; Hollow hexagon turret lathe, No. 4-A; Cutting speed preselector; Heavy-duty bar tools for ram type turret lathes; Heavy-duty chucking tools for the 4-A turret lathe; Threading attachment for ram type turret lathes.

Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.
Two sizes of multiple-station automatic nut forming machines; Complete line of multiple-plunger crank eyelet machines for deep and heavy drawing; Upright high-speed cone wire drawing machines for the drawing of nonferrous wire; Small safety power bench press; Hypro solid die double-stroke crank header 3/16 by 1-inch length capacity; New line of automatic chain-feed thread rolling machines.

Weber Tool Mfg. Co., Los Angeles.
Air seat grinder.

Welding Timer Corp., Newark, N. J.
Welding timer.

Weldit Acetylene Co., Detroit.
Welding torch.

Weldon Tool Co., Cleveland.
End mill sharpening fixture.

Wellman Engineering Co., Cleveland.
Dredging bucket, 3½ cubic yard capacity.

Wells Mfg. Co., Greenfield, Mass.
Drill sharpener.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Unit for cleaning air electrically; Auxiliary relay; Universal oscillograph; Induction regulator for small capacity circuits; Contactor for built-in applications; Three-light bulb; Illumination analyzer; Contactors, 100-150-ampere; Trough lighting unit; Industrial mountings for high intensity mercury lamps; Outdoor lighting fixture; Universal floodlights; Automatic recloser; Mine locomotive headlights; Circuit breakers for lighting and power circuits; Enclosed "De-Ion" flip on circuit breakers; Two-element detachable meter; Direct-current welder known as the "Flexarc" unit; High-intensity stroboscope; Angle switching equipment; Turbine generator, 183,333-kilovolt-ampere unit; Explosion-proof industrial motor, 300 horsepower, 3600 revolutions per minute; Static alternating-current voltage regulator; Five-hundred horsepower synchronous induction motor; Three thousand horsepower motors for driving the finishing train for a 56-inch hot strip mill; Generators rated at 82,500 kilovolt-amperes, 60 cycles, 16,500 volts, 180 r.p.m.; Two 56,000 kilovolt-ampere vertical waterwheel generators; Enclosed fan-cooled direct-current motor; Range multiplier for light meter; Electronic dynamic balancing machine; Draw-out units for distribution switchboards; Compact direct-current industrial analyzer; Self-regulating battery charger; Motors for close-coupled pumps.

Weston Electrical Instrument Co., Newark, N. J.
Photronic control which turns lights on and off automatically to maintain a predetermined level of illumination; Self-balancing potentiometer.

Geo. Whiting Co., Chicago.
Bending or curving rolls.

Whiting Corp., Harvey, Ill.
Insulated and covered crane ladle.

Whitney Metal Tool Co., Rockford, Ill.
Heavy-duty punch.

Wickes Bros., Saginaw, Mich.
Crankshaft lathe.

J. H. Williams & Co., New York.
Threading tool holder; Non-sparking wrench.

Williams, White & Co., Moline, Ill.
Multiple punch; Straightening press.

Willson Products Inc., Reading, Pa.
Flip front welding helmet.

Wittek Mfg. Co., Chicago.
Automatic self-centering reel stand.

Wodack Electric Tool Corp., Chicago.
Combination electric hammer and drill.

Wood Shovel & Tool Co., Piqua, O.
Closed back shovel.

Worthington Pump & Machinery Corp., Harrison, N. J.
Centrifugal pumps; Steam booster compressor; High vacuum pump; Totally-enclosed pump; Interchangeable breaker and sheeting driver; Truck-mounted compressors; Rotary pumps; Portable air compressors.

Yale & Towne Mfg. Co., Philadelphia.
Hand lift trucks and skid platforms; Load handling device.

Yarnall-Waring Co., Philadelphia.
Tandem blow-off valve; Steam trap; Hard-seat blow-off valve.

Yoder Co., Cleveland.
Automatic window moulding forming and bending machine; Steel mill scrap cutters; Steel mill slitters; Duplex brake shoe machines; Automatic strip and section cutoff machines; Strip tension reels for rewinding steel strip; Single and multiple strip edge conditioning machines.

Zeh & Hahnemann Co., Newark, N. J.
Horn presses with hinged table.